#### modern machine shop

SEPTEMBER 1961

ELECTRON BEAM WELDING

See Page 124

HOW TO BEND WELDED STEEL TUBING

See Page 130

The MAGAZINE for PRODUCTION EXECUTIVES in METALWORKING PLANTS

#### FOSMATIC NUMERICAL CONTROL

Increases Small Lot Profit At Numerical Machining, Inc., (Nu Mac) Cleveland, a tape-controlled Fosmatic Model 54 performs intricate boring operations on precision gear boxes in small lots. For facts on this Fosmatic, write for bulletin FPB. The Fosdick Machine Tool Company Cincinnati 28. Ohio



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#### modern machine shop

For Production Executives
Vol. 34, No. 4, September, 1961

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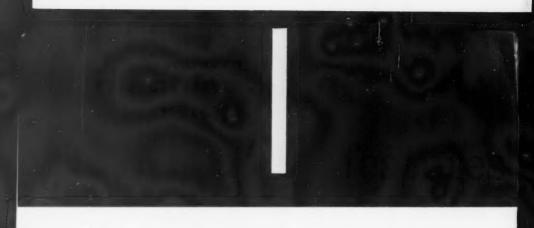
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A STATEMENT OF POLICY—The principal function of MODERN MACHINE SHOP is to search out and disseminate the best and newest ideas for advancement of engineering skill and mechanical efficiency in the metalworking industry and neither effort nor expense is spared in the performance of this task.

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page

#### 116 LET'S DISCUSS NUMERICAL CONTROL

By K. M. Gettelman

This first article, in a series that will discuss the major areas of numerical control and the programming techniques, defines numerical control and lists the areas of its potential profitable use. The material for these articles was derived from course material developed for the American Machine Tool Distributors Association and from interviews of personnel of the Boeing Applied Computing Services of Wichita, Kansas.

#### HOW ELECTRON BEAM WELDING FACILITATES HIGH PRESSURE VESSEL PRODUCTION

By Kenneth J. Miller

When The Garrett Corporation's AiResearch Manufacturing Company Division at Los Angeles received a contract from Lawrence Radiation Laboratory to produce spherical ultra-high pressure vessels for containing liquid gas mediums at pressures ranging between 10,000 and 20,000 p.s.i., it introduced a fabrication difficulty which, in final solution, lead to an entirely new product line. The fabrication difficulty



was in welding the Hydroformed or forged hemispherical pressure vessel halves together in a manner to withstand the tremendous strains involved. The difficulty was solved by obtaining an electron beam welder.

#### 130 HOW TO BEND TUBING

By R. M. Spencer

The author, who is chairman of the Carbon Technical Committee of The Welded Steel Tube Institute, discusses the advantage of welded steel tubing and recommends procedures for bending such tubing most efficiently.



#### 138 MAINTAINING DIMENSIONS RELATIVE TO Λ FLOATING FACE

By C. B. Weidner

A method for holding a depth of counterbore in relationship to a face with a dimensional float is illustrated and described by the author.

#### PLUG-IN BUS DUCT INCREASES SHOP VERSATILITY By Robert F. Judy

At Guidance Technology Inc., Santa Monica, California, a 3-foot high 440-volt three-phase bus duct running the length of the shop floor between two oppositely facing rows of machines has greatly simplified the problem of continual rearrangement of the machines for straight-line production of the many short-run, high precision components being produced. It has been proved to the satisfaction of all con-

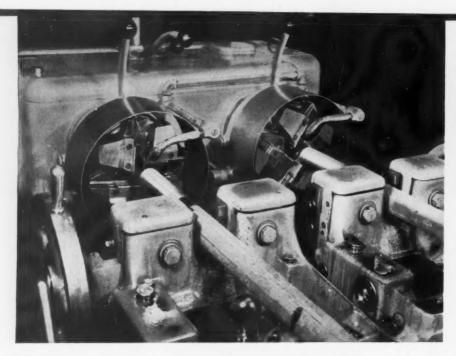


cerned that rearrangement of the relatively small machines into short and unified production lines is much simpler than the awkward and often torturous in-shop handling that results when all machines are left permanently mounted in one place.

#### PORTABLE MILLING TOOLS SOLVE LUG MACHINING PROBLEM

By Gilbert C. Close

Faced with the problem of re-dimensioning and slotting 240,000 p.s.i. steel lugs on landing gear struts which were already installed on the airplane, tooling engineers at the Long Beach, California Division of Douglas Aircraft Company, devised portable milling tools which enabled the lugs to be machined without dismounting the struts from the airplanes.



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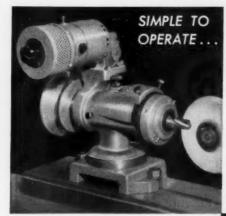


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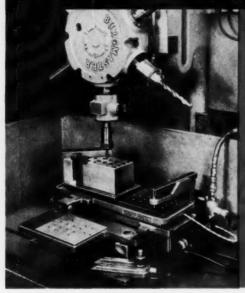
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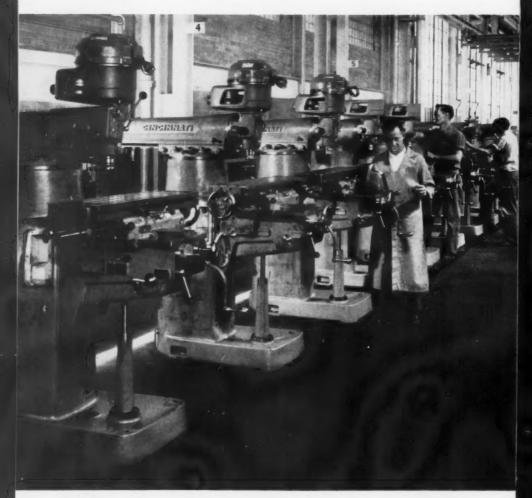


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#### a message to owners of

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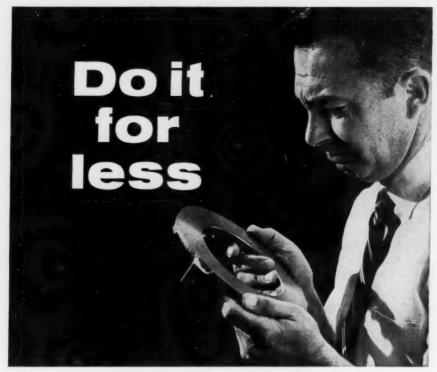
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giving full details and specifications on this remarkable, BIG, lead screw tapping unit. Explains operating advantages, capacities, lists features.

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MODERN MACHINE SHOP

September, 1961



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BAND SAW BLADES

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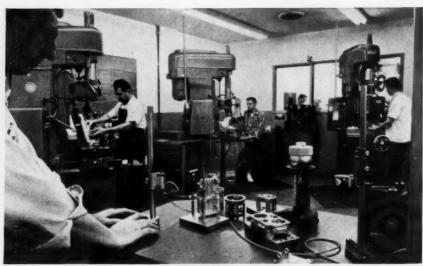
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"At Fibreform Electronics, we feel

strongly that the seven Moore Jig Borers we have purchased since 1956 are the heart of our business today, and will continue to be in the future."

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that Logan is your best dollar
value in the lathe field.

#### accurate



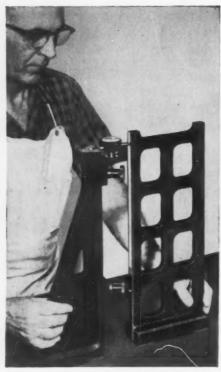
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- Registers angular errors to plus or minus .0001"
- Dial indicator for easy, visual measurement
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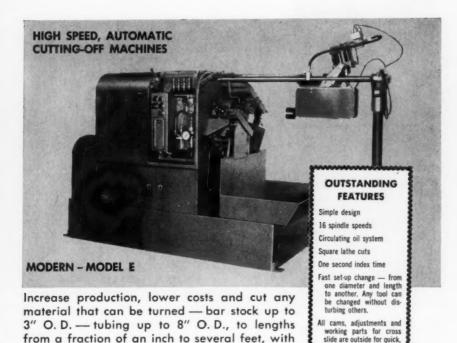
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tools. We also engineer and build machines using the same bodies and spindles - for such operations as trimming ends of drawn shells and filler caps. Send prints for quotes.

from a fraction of an inch to several feet, with

micrometer accuracy. Ideal for use with carbide

Catalog and production figures mailed on request.

easy adjustment.

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Chip pan slides out, for easy

Power, speed and rigidity for cast alloy and carbide

Special spindle bearing takes all collet thrust. No thrust

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We can furnish special tooling to meet your rerequirements - to cut-off, form, groove, flange and chamfer in a single operation, at a high rate of speed. Send prints.

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A COMPLETELY NEW LINE OF HIGH-SPEED
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HEAVY-DUTY OPEN-GAP PRODUCTION PRESSES

Our quantity production gives you highest quality at lowest cost.

THEY HAVE "EVERYTHING" ...

Dual Safety Hand Lever Controls
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September, 1961

MODERN MACHINE SHOP

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type 6" roller lapping machines to 48"

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You can save real time and money in the production of parts for jigs and fixtures, dies, gages, templates and special machine production by using an Oliver of Adrian contour sawing and filing machine.

The Oliver is so simple to operate that all sawing, filing and lapping can be handled by an ordinary mechanic—saving a skilled die maker's costly time. Parts can be shaped to dimension faster, more accurately with no hand filing or semi-finishing operations. Available in five types — bench or pedestal. Write today.

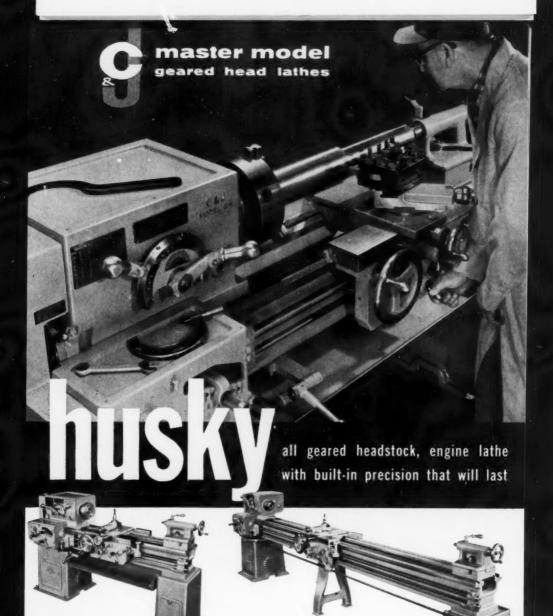
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- 16" and 18" swing . . . 36" to 156" center distances
- Loaded with modern features
- Designed with every turning job in mind
- Economy priced, too!

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CARROLL-JAMIESON MACHINE TOOL CO.

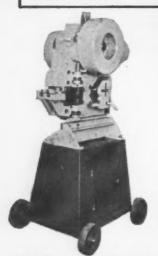
Batavia, Ohio

in our 58th year

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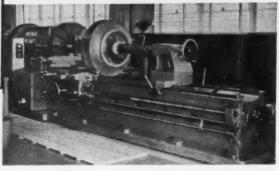
of Leadership, Quality and Acceptance.

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#### IMPERIAL MULTI-MATIC #10 IRONWORKER

Stationary and portable types SHEARS - PUNCH - COPING - NOTCH and BAR CUTTER. \$2895.



#### IMPERIAL SLIDING BED GAP LATHE

from 30" ctrs. to 300" ctrs. MISSILE - T - SLIDING BED & SPECIAL LATHES TO ORDER. Flame hardened, ground bed ways. Heat-hardened gears throughout. Precision roller spindle bearings.



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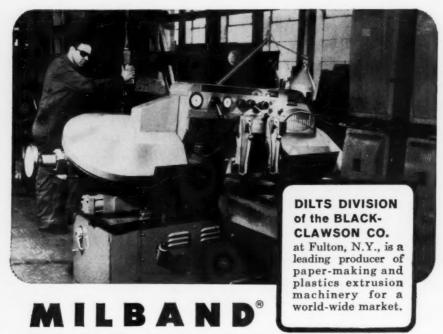
Compound "Knuckle Joint," 12" cross travel, 11/2 H.P. 42" x 9" table. Power feed to table measuring and slotting attachments, accessories. Complete \$2314.50



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#### **Band Saw Machine Tool**

"Considerable savings in cutting time... spoilage is negligible...maintenance is no problem," says Shop Superintendent Howard Knight after a year of experience with the MILBAND Machine Tool. Metal-cutting work at DILTS DIVISION of BLACK-CLAWSON CO, involves a variety of carbon and stainless steels for the intricate custom-made machinery designed and fabricated by the company.

Dilts Division is one of many users who have found that MILBAND's rugged construction eliminates destructive vibrations. The results are a high degree of accuracy and noticeably long blade life . . . especially when the MILFORD REZISTOR High Speed Steel Blade is used in combination with the MILBAND Machine. Superior Blade Control Engineering at every critical point in the MILBAND . . . including 30° blade twist, large 22″ blade wheels and 15½″ pivot span . . . assures

maximum blade life and precision cutting on the toughest jobs.

Demonstrations are easily arranged. Write us for the name of the MILBAND dealer nearest you... and for this free circular explaining all the cost-cutting facts about the MILBAND Machine Tool.

THE HENRY G. THOMPSON & SON CO.

Chapel & Will Sts., New Haven 5, Connecticut Saw Specialists for 85 Years

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Denienn, Denienn HydrOlLics, and Multipress are



How STEWART-WARNER
produces 220 different assemblies on
one DENISON Multipress and saves...

## MONEY



THIS HEW SERIES
"A" MUNIPRESS
assembles 220
different assemblies and prepares them for
brazing at
Stewart-Warner Corp., Chicago.
Write for free Bulletin 324-New
"R-S-T" Series Multipress

cost-saving versatility was a key requirement on this pressing job. To produce assemblies for a new product line, Stewart-Warner's Alemite Division needed a press set-up that could handle up to 220 different assemblies. And because of the short runs involved, fast changeover with minimum downtime was a must. Installation of just one Denison hydraulic Multipress filled the bill.

This Denison Series "R" 6-ton bench press, equipped with automatic index table and special "quick-change" tooling, assembles from 600 to 850 assemblies per hour. Finished parts are uniform, high-quality ... no rejects. And tooling changes can be made in minutes to accommodate the full range of 220 different types and sizes.

A unique feature of this operation is an adjustable applicator mounted on the index table that automatically applies a metered amount of brazing compound to each two-piece assembly. It completely eliminates a former hand operation—and does the job better.

What's your problem? Ask the nearby Denison Production Specialist about a Multipress Analysis Program in your plant now. It can MAP new ways to cut your costs, get better quality finished products.

#### DENISON ENGINEERING DIVISION

American Brake Shee Company 1254 Dublin Road • Columbus 16, Ohlo

HYDRAULIC PRESSES
PUMPS • MOTORS • CONTROLS

#### DENISON

HYDRAULIC MULTIPRESS

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#### NEW Grip-Tip CENTERS



Grip-Tip Centers are specifically designed to substantially reduce your replacement costs and machine down-time for regrinding or replacement of worn or chipped centers.

Male or female carbide tips are inserted or removed from the tool steel holders by simply turning a screw. The unique clamping action of holders on tips is positive and quick . . . you save replacement time with Grip-Tip Centers.

The life of Grip-Tip holders is practically unlimited, for, only the dull or chipped carbide tips are

reground. Because the steel holder is not ground when sharpening the carbide tip there is less clogging and longer life for your diamond wheels. Also, the relatively inexpensive double end tips in both male and female types can be stocked with a minimum investment . . . Grip-Tip Centers reduce tool and inventory costs.

Grip-Tip Centers increase your production by permitting full utilization of machine tools. It takes but a minute to remove old carbide tip and replace with a new one... machine down-time is less with Grip-Tip Centers.

For Further Information, Write to:

#### DETROIT REAMER & TOOL CO

P. O. BOX 174 . BIRMINGHAM, MICH.



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# 10 WAYS TO GRIND AT LOWER COST...



#### tool post grinders

Precision built for secondary grinding operations on lathes, millers, planers, shapers, grinders, boring mills to save handling, moving, set-up and down-time. Easily adapt to bench use or special machines. Deliver accuracy to 0001\*, surface finishes to 6 micro-inches. Easy, simple mounting and use by regular machine operators. 9 models, 1/14 to 3 hp., swing 1/8" to 12" wheels. Priced from \$33, FOB Racine.

#### PRECISION GRINDING TOOLS



#### hand grinders

Rugged, lightweight, powerful. Balanced, precision construction provides true spindle alignment and rigidity for longer wheel life, maximum service on fine die work or rough deburring. 7 models, 1/20 to 1/4 hp. Priced from \$41.50, FOB Racine.



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Easy-to-handle, power-packed, versatile. Speed cutting, polishing, routing, grinding, deburring on all metals and plastics. 3 models, 1/15 to 1/4 hp. Priced from \$74.50, FOB Racine.



#### quills

Finest precision construction for use as interchangeable spindles on Dumore Tool Pool Grinders...inexpensive heads in special setups...replacement spindles or high-speed attachments for standard machines. 51 types 25 models. Priced from \$107.50, FOB Racine.



#### hand grinding at Its best

with Dumore Hand Grinders



YOUR DUMORE DISTRIBUTOR HAS COMPLETE STOCKS FOR FAST DELIVERY









with Dumore internal grinding quills to depths up to 24"

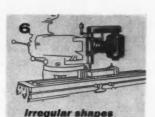
internal grinding down to 1/8" diameter wit mounted wheels or burrs



external grinding ple power for rapid stock removal; ximum production on big jobs



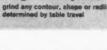
surface grinding convert planers, shapers, ers to precision





single purpose grinding on the bench or in special eet-ups







lightweight working convenience **Dumore Flex-Shaft Tools** 



THE DUMORE COMPANY 1300 Seventeenth Street, Racine, Wisconsin

PORTABLE

PRECISION

METALWORKING TOOLS

HI-SPEED ORILL UNITS . DRILL-N-TAP UNITS PRILL UNITS + DMILL HEADS + WICKG-DMILLS DMILL GRNDERS + TOOL POST GRNDERS HAND GRINDERS + FLEX-SHAFT TOOLS QUILLS AND ACCESSORES + VERSA-MIL

When you have a need for erector-type components for special machines . . . machining heads, feed tables, machine beds... contact our subsidiary Master Manufacturing Company, Hutchinson, Kansas.

...SEE HIM FOR A DEMONSTRATION...OR WRITE FOR BULLETIN G-60-C

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September, 1961

MODERN MACHINE SHOP

# THE NAME FOR PROGRESS

STANDARD AND SPECIAL MILLING MACHINES YOUR ANSWER TO TODAY'S METALWORKING PROBLEMS!



2-Dimensional Pantomills for engraving and light milling 3 sizes.



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Vertical Jig Boring/Milling Machine for mill-ing, drilling and boring. Large capacity— optical system — infinitely variable speed

GORTON

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From pantomills to transfer machines, Gorton through imaginative design provides the user with advanced methods. Real savings in time and money are accomplished with standard or specialpurpose machines with manual, semi-automatic or automatic controls. Complete line of small tools and accessories available. Write for literature about Gorton equipment which will help solve your metalworking problems.



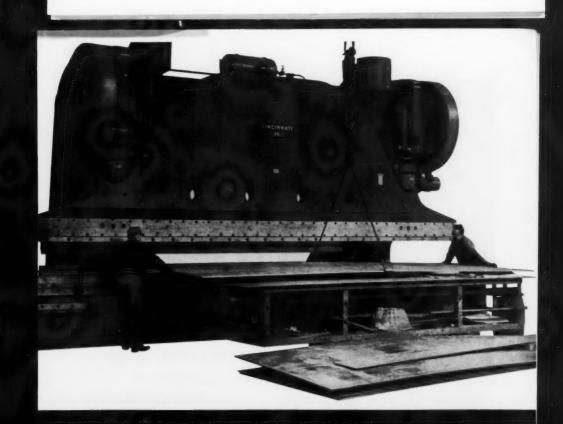
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Milling, Die Sinking, Protiting und Engraving Machines with Manual Hydraulic, Electro-Hydraulic or Numerical Guidance Systems. STACE 1897 Special Machines and Automated Transfer or Indexing Machines. Cutting Tools and accessories. Defense and special products

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# gets new business

Bigger jobs, fewer welded seams, less handling, and easier operation—McGregor-Michigan Corporation gets all four advantages from this 36 Series Cincinnati Press Brake.

As a result, "this new brake . . . helps us be more competitive with some of the larger shops," says R. Hilprecht, sales manager of this steel plate fabricating shop.

This is another example of the way Cincinnati Press Brakes and Cincinnati Shears are reducing costs and opening up new business for shops across the country. If you don't have the new catalogs on these machines, both mechanical and hydraulic, please write for them. Shapers / Shears / Press Brakes

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SHAPER 66.



Cincinnati 11, Ohio, U.S.A.

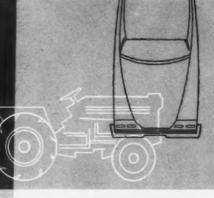
United Kingdom: The Cincinnati Shaper Co., Ltd., Glasgow, Scotland

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# CLEEREMAN

SERIES A, AUTOMATIC CYCLE,

#### DRILLING AND **TAPPING** MACHINES

To meet the needs of industry for precision parts for quality products, Cleereman has developed a full line of Drilling and Tapping Machines.

The latest developments of the Series "A" are Special Purpose Arrangements for small lots or production runs.

- Two or more columns can be mounted on a special base.
- High precision production through use of rotary type index tables.
- The building block concept provides low cost initial investment and basic machine elements for changeover to new and different piece parts.
- · Complete automatic cycle push button operation at all stations.
- Ease of set-up, pick-off change gears, broad range of speeds, feeds and tap leads.

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#### CLEEREMAN MACHINE TOOL CORP.

General Distributor: The Jackson-Fotsch Co. 7354 W. Lawrence Avenue, Chicago 31, Illinois

Factory: Green Bay, Wisconsin

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ocial Purpose Series "A" with tary Type Index Table.

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SPECIAL RH & HIGH SPEED

TAPS • DIES • THREAD PLUG & RING GAGES



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SAZE	THREADS PER INCH	SIZE	THREADS PER INCH	SIZE	THREADS PER INCH	SIZE	THREADS PER INCH
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9/64	30-32-38-40	.550	24	1-3/8	5-8-10-14-16-18-20-24-27-	3-7/8	4-8-10-12-16 Many more
148	38	9/16	10-13-14-16-20-24-26-27-	/-	28-32-40	4	4-6-8-10-12- sisses in
5/82	24-26-28-30-32-36-38-40-50		28-30-32-36-40-48-56-80		12-16-18-20		16 stock up
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MZE		ABOVE	SECTION	N FOR		SIZES	THREADS
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Size Threads	Size Threads	6
2 56 NC, 64 NF 9/16 12 NC, 18 NF	1 8 NC, 12-14 NF	10
5/8 11 NC, 18 NF	1-1/4 7 NC, 12 NF 1-8/8 6 NC, 12 NF	1/4
11/16 11 ME, 16 NS 9/4 10 NC, 16 NF	1-8/8 6 NC, 12 NF 1-1/2 6 NC, 12 NF	5/1

Right Hand—U	Right	Hand "P					
And Extra L  Size Threads 4 36-40 MC, 48 MF 5 40 MC, 44 MF 6 32 MC, 40 MF 10 24 MC, 32 MF 110 24 MC, 32 MF 12 24 MC, 32 MF 11/4 28 MF 15/16 24-NF	ength Taps Size Threads 3/8 24-Ni 7/16 20 Ni 1/2 20 Ni 9/16 12 NC 9/16 18 Ni 5/8 18 Ni 3/4 16 Ni Also Larger Sixes NC & Ni	Taper "NPT" 5:20 Thread 1 16 27 1 4 27 2-1'2 8 3 8 3-1/2 8 4 8	Size Three 1 1/16 27 1 1 27 1 1 1 1 1 1 1 1 1 1 1 1 1 2 1				

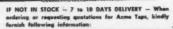
Ri	ght H		"Pip		aps
"N	PT"	1 "N	P5"	EX. L	ENGT
aper Se	"NPT" Thread	Size 1/16	Thread 27	"NI	P\$"
10	27	1-1/4	1119	Size	Thread
9.2	21	1-1/2	1132	1/16	27
4.5		2	111a	1.8	27
		2-1/2		1/4	18

Size	Thread	Sime	Thread
1/16	27	1	11%
1/6	27	1-1/4	11%
1/4	18	1-1/2	115
3/8	18	2-1/2	131
1/2	14	3-1/2	
3/4	14	3-1/2	

Left Hand 'Pipe Taps'

Get all 3... DELIVERY W QUALITY PRICE

ACME TAPS IN STOCK



piece expe ping job e (f) Would

31 S. DESPLAINES ST. CHICAGO 6, ILL. All Phones: Financial 6-1195

# NOW...A Larger Capacity FELLOWS-PFAUTER High-Speed Hobbing Machine...The P 630

You get all the advanced-design features of the production-proved P 400
Fellows-Pfauter hobbing machine — plus extra work capacity
— with the new Model P 630. Takes work up to a diameter of 25".

Maximum face width at 25" diameter is 16%". Maximum diametral pitch in steel is 3. It's fast, easy-to-handle . . . and it's built for high production.

For example: Work area is readily accessible for setup and loading. Table retracts automatically from hob to facilitate work changes. Hob shifting is controlled by pushbutton. And built-in hydraulics assure smooth operation of tailstock and fixtures.

Solid construction features include: rugged hob head and double wall construction column and bed, with heavy V-ways. Table is as large as maximum workpiece diameter, and index worm gear nearly as large as work table. Work column is of massive design.

Reduce your production costs with this new Fellows-Pfauter.

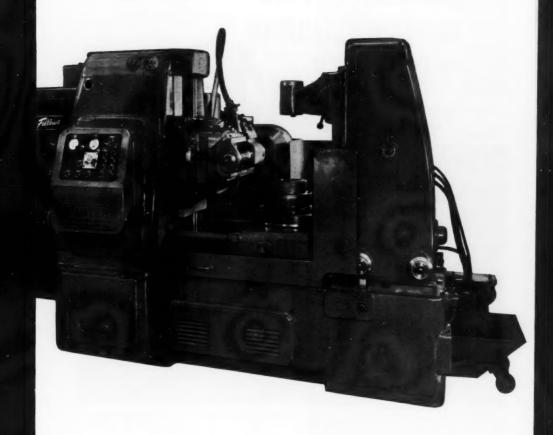
Get complete details now.



#### **NEW...Dictionary of Change-Gear Combinations**

Eliminate tedious calculations and trial-and-error methods for finding change gear combinations. Now, simply look them up like words in a dictionary in "Fellows-Pfauter Change Gear Tables" by F. Becher

and A. Koerner. This English edition contains combinations for more than 26,000 ratios carried to six decimal places from .100,000 to 1.000,000, with the greatest step approximately .00005. Change gears in the range of 18 to 80 teeth are mainly used. Examples of applications are given. Only \$8.00. Get a copy now. Send your order to THE FELLOWS GEAR SHAPER COMPANY, 78 River Street, Springfield, Vermont, U. S. A.



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Gear Production Equipment

For more data circle 341 on Postpaid Card

September, 1961

MODERN MACHINE SHOP

41



A 650 ton Steelweld Hydraulic Press Brake is a mighty important tool at The Bargar Metal Fabricating Co., Cleveland. It performs a wide range of operations such as bending, forming, stamping, punching, drawing.

The brake is especially good for bending large plates, because the ram can be traveled at exactly the right speed to prevent whipping of the plate. Sometimes plates as large as 10' x 20' x 1/4" are bent.

The machine is very useful for drawing operations, excelling mechanical press brakes for this work, because it can be operated at the speed that is most suitable for the metal. Also, the ram can be traveled through a greater distance because of the unusually long 16-inch stroke. The power is constant for the entire stroke.

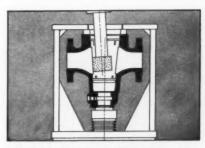
Much punching is done with the Steelweld, and this work is speeded by adjusting the ram stroke to travel only slightly more than the thickness of the plate. The fact that the ram can be inched to the work and backed away whenever desired is another time-saving feature especially helpful when setting up dies.

The Bargar Company has one of the finest and most completely equipped sheet metal fabricating plants in Cleveland. The Steelweld Brake is a good example of their modern production facilities



STEELWELD MACHINERY DIVISION . THE CLEVELAND CRANE & ENGINEERING CO. . 64 8 2 E. 281 ST. . WICKLIFFE, OHIO

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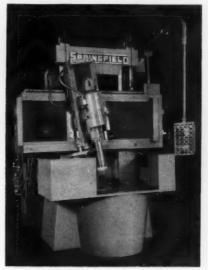
Internal valve tapers, as shown above, are fast payoff jobs on a Springfield Vertical Universal Grinder. On this valve taper, stock removal is 0.020" with a requirement for 85% blue or better on a taper gage. Surface finish is held well within the 30 RMS specified. Machine swings to 52", grinding holes from 2" to 42" dia., 24" deep in irregular or regular shaped work pieces.

Not limited to internal or exterior tapers, a Springfield grinds efficiently on O.D. and I.D. shoulders, offsets, undercuts, irregular holes, and mating angles

-usually in one chucking.

A few production and toolroom men turn to a Springfield because there's no other way to do the job. Most turn to a Springfield because it's the most profitable way to do many jobs. Write today for Bulletin No. 197-D. The Springfield Machine Tool Company, Springfield, O.

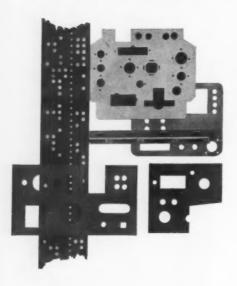




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related /



A spoken command, a wave of a wand. And-before your very eyes-a magician plucks from his hat rabbits, pigeons or chicks-one, two, or six of a kind. The right equipment is the key to his magic.

For metal fabricators, the WIEDE-MANN is the right equipment to pierce plates and panels on a short run and medium production lot basis. A WIEDE-MANN makes possible the production of 1-10-100-1000 or more parts-economically, accurately and efficiently-with a mini-

mum of preparation.

Turrets carry all punches and dies ready for immediate use. Work is positioned mechanically to rapidly and accurately locate and pierce holes of many sizes and shapes. This combination eliminates layout, setup, handling, expensive tools and most costly factors which are necessary in other methods.

The new WIEDEMATIC is the latest and most efficient WIEDEMANN turret punch press. This machine is designed specifically for highspeed short and me-dium run production. Tool selection, work positioning and piercing are fully tape-controlled. Engineering changes, too, are readily made by simply substituting desired information on the tape.

In metal fabrication, a WIEDEMANN is your magician's hat. And-because of it-you realize substantial savings unheard of with other machines in the field. Write today for complete information on how a WIEDEMANN will make money for you. Include drawings for time study and recommendations for the right equipment.



From the versatile 150 ton R-15 down to the hand operated R-2, there's a Wiedemann for your short run piercing requirements.

WIEDEMANN

WIEDEMANN MACHINE COMPANY Dept.MM9, Gulph Road . King of Pressia, Pa.

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Pieces per grind, cutting speed, and ability to cope with variables in metal, lubricant, or chip removal determine the real cost of cutters—often add up to many times the price.

That's why hidden qualities in tools are what CUT DEEPLY into total cost of: sharpening, tool-change downtime, and high-priced metals. You can't see balanced hardness and toughness in a Barber-Colman cutter, but it's there—

in selected high-speed steel . . . with careful



heat-treating subject to constant inspection. Delivered fast by your Barber-Colman representative.

BARBER-COLMAN COMPANY 94 Loomis St., Rockford, III.

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September, 1961

MODERN MACHINE SHOP

45





MILL ACME feur head grinding and polishing machine for the progressive finishing of stainless steel strip. This unit will process material .010" to .250" thick and 30" wide and produce up to No. 4 finish.

This four head HILL ACME abrasive belt grinding and polishing machine requires only half the floor space of four conventional strip grinders. The flexible design permits the addition of any desired number of heads.

For heavy stock removal "wet" grinding is recommended with 600 GPM coolant. Sludge passes through the bottom of the machine to the filter unit. Tests prove that considerable less coiled material is lost than in previous methods. A built-in oil mist spray system is used in polishing operations. Rubber covered guide rolls, built into the machine, create the proper "break" angle of the strip over each billy roll to flatten the strip at the point of contact with the abrasive belt. The billy rolls are actuated vertically by hydraulic power to overcome the tension on the steel strip.

This unit is the result of thirty years of success in producing endless abrasive belt grinding and polishing machines for all types of ferrous and non-ferrous materials.

Complete details are available.

#### The HILL ACME Company

Also Manufacturers of:

"HILL" Grinding and Polishing Machines • "ACME" Forging Machines • "CANTON"
Retury and Alligator Sheers • BAR-BILLET Sheers • MATERIAL HANDLING
Equipment • "CLEVELAND" Knives and Sheer Blades • KLING Metel Working Tools.



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Automation need not be expensive! With the Bellows Air Motor — the *original* air cylinder with built-in valve and operating controls — your own men can automate existing machinery or build special-purpose high-speed equipment that boosts production per man-hour, improves quality, reduces scrap, prolongs tool life.

Bellows Air Motors provide all the motions necessary to control or operate machinery — push-pull, lift-lower, twist-turn—quickly, economically, dependably. Available in a wide variety of bore sizes, stroke lengths and mounting styles, and with a wide selection of control valves, Bellows Air Motors can provide low-cost solutions to countless production problems in your plant.

Actual case histories and complete information on Bellows Air Motors and other Bellows "Controlled Air."

Power" Work Units are yours in free Bulletins BM-25 and ML-5. Address Dept. MMS-961, Bellows-Valvair, Akron 9, Ohio. 654-C-3

Bellows - Valvair

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September, 1961

MODERN MACHINE SHOP

47







### First from LeBlond Continuous-Path Tape Controlled Lathes

Talk to LeBlond about Tape-Turn lathes. You'll be talking about machines we've got on the run off floor rather than on the drawing board. We're delivering at least six months ahead of competition. Our experience can help you get an important edge on your competition.

Tape-Turn is being built with 20 to 75 hp in sizes from 2013 to 4025.

100% tape commanded by G. E. Mark Century control—all operator controls at the console—solid state components (no tubes, stepping switches or rotating parts)—temperature and humidity controlled—built-in computer for linear and circular interpolation.

#### Benefits

Increased efficiency and management control, reduced lead time, a permanent record in easily-stored form, low-cost quality control, reduced parts inventory, shorter set-up time and lower tooling costs.

Ask to have a LeBlond field engineer stop and talk Tape-Turn, the machine on the floor instead of the drawing board. Or write for our new descriptive bulletin TT-1061 C.

The R. K. LeBlond Machine Tool Company Cincinnati 8, Ohio

Leading the way
in numerically-controlled
turning.



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50



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# AIRETOOL

PNEUMATIC TOOLS

**POWER** and **PRECISION** 

for every job

A complete line of pneumatic tools . . . proved on the job for speed, durability and precision. Compact, lightweight and easy to use. Whatever the job...there's an Airetool-designed airpowered tool to do it better ... faster.















A few of Airetool's extensive line of tools are shown here . . . but you can test any Airetool in your own shop at no cost. Simply call your Airetool representative . . . or, write direct.

Representatives in principal cities of the free world



For more data circle 350 on Postpaid Card

### NEW Brown & Sharpe

GREATEST ADVANCE IN SLITTING SAWS IN 50 YEARS!

A super-finish saw so tough it can't scratch itself.



The mirror-like finish of new B&S "Sawperior" slitting saws mark 3 new developments that more than double production and make other saws virtually obsolete!

**NEW** Alloy High Speed Steel for Longer Life.



Brown & Sharpe



#### PRODUCTION BENEFITS

Shop tests prove the new tooth geometry and mirror-like finish give up to 4 times as much slitting production between sharpenings.

Super finish on sides permits use of less concavity or side clearance thereby providing a stronger saw section and a stiffer, more accurate saw.

Smooth side finish resists scratching. resists corrosive action of coolants and rust.

New saw design requires less milling machine power thereby allowing heavier cuts without strain or chatter.

New saw geometry and super finish sides give smoother surface finish in cut.

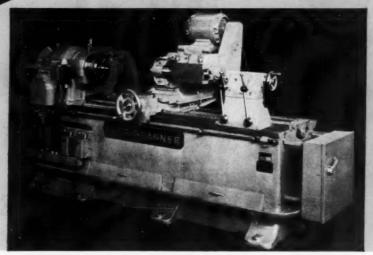
For that EXTRA Edge in Production!

Send for B&S Cutting Tool Condensalog . . .



**Cutting Tool Division** Brown & Sharpe Mfg. Co. Providence 1, Rhode Island





Building precision into other machine tools is the unique distinction that can be claimed for The Lees-Bradner Model HT Thread Milling Machine.

The worm illustrated above was produced on this machine by the Cleveland Worm and Gear Co. in one hour 23 minutes at a cutter spindle speed of 61 R. P. M. The pitch diameter of the worm was 3.728" with an outside diameter of 4.625".

Many tough thread milling problems like this have been, and are being, solved by this remarkably versatile machine.

Contact us or your local Lees-Bradner representative for complete information on fast, precision threading with the Model HT Universal Thread Milling Machine.

#### **Details on Worm Gear Production**

Hob Spindle Speed	61 R. P. M.
Circular Pitch	1.420"
Pitch Diameter	3.728"
Outside Diameter	4.625"
Threading Time	1 hour 23 min.
Material	2315 Steel
Weight of Worm	51.76 lbs.

IMPROVING GEARS ... FOI

VEADS

The LIES TELLICITED Company

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POSITIVE AUTOMATIC PRESSURE

FOR ANY

### HYDRAULIC SYSTEM

ALERT...instant pressure regulation gives complete protection FAITHFUL... engineered for long, trouble-free service OUIET . . . shear-closing action eliminates "chattering"

Whatever your requirement . . . for O.E.M. use or replacement service, there's a dependable FULFLO Oil By-Pass Relief Valve designed just right, built right and priced right, too!

#### STANDARD MODELS

Screw or flange types—to 500 lbs.—for pipe sizes to 3"—steel, cast iron or brass bodies-brass, steel or stainless trim.

#### **SPECIALS**

Engineered to your most exacting requirements, for any application, designed to do your particular job to perfection.



Write for Data Book with complete specification and engineering data.

THE FULFLO SPECIALTIES COMPANY, INC. • 416 Fancy Avenue • Blanchester, Ohio For more data circle 353 on Postpaid Card

# BURRAWAY TOOL



CHECK IL MINISTER

# Deburrs both sides of holes in one pass

Spring load adjustment permits setting for light deburr or up to ½" chamfer. Burraway works in any head—drill press, lathe, automatics or multiplespindle machines. Available in sizes from ¾2" up.

Many small parts can be hand held and passed over the revolving tool to eliminate fixturing.

For more details on this and other Cogsdill hole finishing tools write for free catalog.

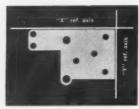




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# Sheffield Ferranti FI-22 locates holes to within .001" faster than you can read this



 The problem: locate the holes in this piece to within .001". Here's how it works.



Mount and clamp workpiece to table. Work ing range of table is 15" by 24".



Insert flat probe for aligning and locating reference edges of work piece.



 Move spindle along "X" axis until probe touches reference edge, and push zeroing button. Repeat for "Y" axis.



Replace flat probe with suitable tapered probe. Interchangeable tips available for a wide range of hole sizes.



 Move spindle over piece, and lower probe into hole. Numerals in readout panels will indicate exact hole position to .001".

You can see why the FI-22 is up to ten times faster than conventional surface plate and height gage inspection. On top of that, you can use it for layout scribing and center-punching. Write for Bulletin FI-22X and ask your Sheffield representative where you can see a demonstration of this machine.



A subsidiary of The Bendix Corporation

Inspection Gages, Dimensional Control Instruments, Machine Controls, Automatic Gaging & Assembly Systems, Measuray® X-Ray Thickness Measuring, Crushtrue® & Multiform® Grinders, Cavitron® Ultrasonic Machine Tools, Press-Pacer® Transfer Units, Large Dies, Tooling, Contract Manufacturing.

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HERE ARE PROGRESSIVE STEPS IN THE EXTRUSION OF AN AUTO-MOTIVE BEARING RACE







### EXTRUDOIL **#51 DO Concentrate**

helps cold extrude another bearing race . . . does a better job regardless of type of equipment used.

#### IN COLD EXTRUSION, SUCCESS DEPENDS ON LUBRICATION

and Macco Estrudoil #51 DO Concentrate provides the RIGHT KIND OF LUBRICATION for SPARK PLUG SHELLS. SCREWS. GEARS. BEARING RACES. TAPPET BODIES. SLEEVES. BOLTS. WORNSHAFTS and a host of other precision

#### ARE THESE ADVANTAGES OF INTEREST TO YOU?

REDUCES PRODUCTION COST . INCREASES PRODUCTION DUE TO LESS DOWN TIME BECAUSE OF TOOL CHANGES FREER FLOWING OF METAL AS-SURES MAINTENANCE OF ABSO-LUTE TOLERANCES
CUTS INVENTORY COST.—ONE LUBRICANT DOES ALL THE JOBS
CUTS DIE TRY-OUT TIME

Macco Extrudoil #51 DO Concentrate is the first choice of experienced extrusion men because Macco research and development, working hand-in-hand with leading extrusion equipment manufacturers, developed this lubricant to meet the distinct needs of cold extrusion. It works better! Macco Extrudoil #51 DO Concentrate is far ahead of the field . . . proved in production beyond question . . . used every day for the most demanding jobs. A trial will prove it to you. If you are now engaged in cold extrusion, or even thinking about it, it will pay you well to talk to a Macco engineer, and find out for yourself why

> THE METALWORKING INDUSTRY LOOKS TO MACCO FOR LEADERSHIP

CLEANING COMPOUNDS CUTTING LUBBICANTS



**RUST PREVENTIVES** FORGING COMPOUNDS **EXTRUSION LUBRICANTS** 



9204mm S. SANGAMON ST., CHICAGO 20, ILLINOIS PRESCOTT 9-0800

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#### A MODEL FOR EVERY APPLICATION

Whatever needs to be held securely—by forces of fractions of pounds or multiple of tons—you can have absolute control with a De-Sta-Co clamp. Miniature models are available for extra light jobs—rugged, hefty models for heavy duty jobs—plunger action models for push or pull jobs—air-hydraulic operated models for multiple, split-second remote control operation. Select the model to fit the job, controlled holding power is yours, with De-Sta-Co.

DETROIT STAMPING COMPANY - 340 MIDLAND AVENUE - DETROIT 3, MICHIGAN



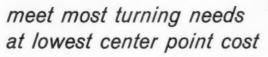
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### LIVE CENTERS



UNIVERSAL models for super accuracy to .0001, high load capacity, perfect for grinding and other high-precision work



MULTI-DUTY models for general use, perfect for light work, interchangeable parts provide quick changeover for multi-purpose operations.

Over 40 sizes ... with all popular tapers ... in four styles . . . to choose from. That's how Ideal helps you meet your turning needs for the heaviest work to the lightest of light jobs.

Ideal Live Centers are guaranteed to provide the highest accuracy required, exactly matching the lathe size you use. What's more, they are custom quality designed and manufactured by production methods to give you the lowest possible precision center point costs.

You can get Ideal Live Centers from your distributor's stocks. He'll give you immediate delivery service-which reduces your inventory requirements and cuts your investment costs. If you need a special, we'll be glad to work with him to meet your specifications at the right price.



**HEAVY-DUTY** models for extra rugged work, give close tolerance results



PIPE POINT models for cylindrical turning of pipe, axles and other hollow shapes, six sizes from 31/4" to 71/2" dia.

SOLD THROUGH LEADING INDUSTRIAL DISTRIBUTORS In Canada: IRVING SMITH, Ltd., Montreal

Write for new LIVE CENTER Catalog

IDEAL INDUSTRIES, Inc., 1031-1 Park Avenue . Sycamore, Illinois

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September, 1961

MODERN MACHINE SHOP

### POLISH METALLURGICAL SPECIMENS

SYNTRON

VIBRATORY

# POLISHING MAGNINES



#### POLISH SAMPLES FASTER, BETTER, MORE UNIFORMLY

Easy, mechanical polishing of metallurgical specimens for examination analysis, or electron photomicrographs. Whether it's one or a number of specimens, just place in a Syntron Polishing Machine and adjust vibration to desired amplitude. Samples will move smoothly around bowl and over compound producing the smoothest surface possible.

Syntron Polishing Machines produce smooth, scratch-free surfaces quickly and uniformly every time. Powered by Syntron's famous electromagnetic drive unit assuring you of efficiency, dependability, and low maintenance. Pan and abrasive disc are easily removed and replaced.

Syntron Polishing Machines can speed your specimen processing.

Write for detailed information today.

SYNTRON

SYNTRON COMPANY
309 LEXINGTON AVE., HOMER CITY, PA.

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New Strippit Quick-Change Holder with Micro-Set Gaging System for use on any 15-A, 10-AA or 10-A Strippit Fabricator, with jig bored Micro-Bars and Dial Indicators, allows gage settings to the nearest .001" in seconds. Guess work eliminated in close tolerance gaging—spring loaded Dial Indicators provide sensitivity and "feel" in settings. No need for special gages or jo-blocks. Use quick-reading built-in scales when close tolerance gage settings are not required.

This new system, now available on all new Strippit 15-A Fabricators, also quickly adapts to all existing 15-A, 10-AA and 10-A Fabricators. Let your Strippit Tool & Methods Engineer arrange to demonstrate this new Micro-Set Gaging System to you. Or write for Catalog MS.

#### WALES STRIPPIT INC.

207 Buell Road Akron.

Akron. New York

In Canada: Strippit Tool & Machine Company, Brampton, Ontario; In Continental Europe: Rashin, S. A., Lausaane, Switzerland; In the British Isles: Kearney & Trecher-C.V.A. Ltd., Hove, Sussex England.

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September, 1961

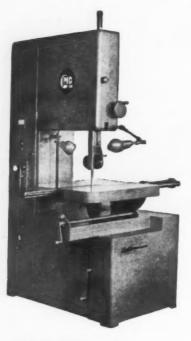
MODERN MACHINE SHOP

# GROB SPELLS THE DIFFERENCE IN

# BAND SAW MACHINES

The new GROB 24" universal band saw has all the famous GROB features:

Quality • Efficiency • Durability • Strength Utility . Low Maintenance . Reasonable Cost



- Speeds infinite from 35-12000 FPM covers both cold and hot sawing
- Variable drive 3-speed transmission with precision rolled gears and splines transmits 15 HP
- Hydraulic table feed

See the difference demonstrated in our dealers' showrooms

Write GROB INC. for complete specifications

GROB also manufactures a complete line of:



**BUTT WELDERS FILING MACHINES GEAR ROLLING MACHINES** 

GRAFTON, WISCONSIN

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# FOR ACCURATE LOCATING USE UNIVERSAL LOCATING PINS

Universal Locating Pins assure quick, accurate locating throughout even the longest production runs. They're hardened and ground to extremely close tolerances . . . precision made to give long service life for much less than the cost of ordinary tool-room pins.

Press fit, threaded or lock-screw types, round or relieved, are stocked in all standard sizes for immediate delivery.

Write for catalog detailing locating pins plus other Universal production tools.





Relieved Press-Fit Pin Thread







OTHER PRECISION-BUILT COST SAVING UNIVERSAL PRODUCTION TOOLS



UNIVERSAL ENGINEERING COMPANY, FRANKENMUTH 9, MICHIGAN

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September, 1961

MODERN MACHINE SHOP



Almost perfect balance in TOUGHNESS, RED HARDNESS and WEAR RESISTANCE means that du MONT High Speed Ground Tool Bits take a keener cutting edge and hold it longer. That means more cuts per bit, more cuts per dollar for voil.

Make your own tests — compare costs and performance. You'll see why economy-minded buyers specify du MONT High Speed Tool Bits.

#### MAIL THIS COUPON TODAY!

Ple	ase art,	C	na at	il al	fi	g	e	1	Te	j	ol F	r	B	it	-	C	o i	n	n	p	a	ri	S	C	1	1	):	
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#### **Meetings**

## Important Meeting Dates

SEPTEMBER 11-15 • Instrument Society of America, Fall Instrument-Automation Conference and Exhibit and Annual Meeting, Memorial Sports Arena and Biltmore Hotel, Los Angeles. Society headquarters: 313 Sixth Ave., Pittsburgh 22, Pennsylvania.

SEPTEMBER 14-15 • American Society of Mechanical Engineers, Engineering Management Conference (ASME-AIEE), Hotel Roosevelt, New York. Society headquarters: 29 W. 39th St., New York 18, New York.

**SEPTEMBER 17-21** • Nonferrous Founders' Society, Annual Meeting, Shawnee Inn, Shawnee-on-Delaware, Pa. Society head-quarters: 1604 Chicago Ave., Evanston, Illinois.

**SEPTEMBER 24-28** • Pressed Metal Institute, Annual Meeting, Grand Hotel, Point Clear, Ala. Institute headquarters: 3673 Lee Rd., Cleveland, Ohio.

SEPTEMBER 25-26 • Steel Founders' Society of America, Fall Meeting, The Homestead, Hot Springs, Va. Society headquarters: 606 Terminal Tower, Cleveland 13, Ohio.

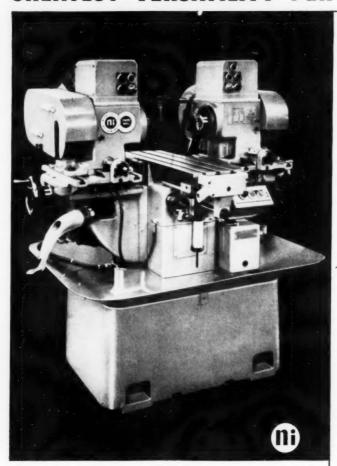
SEPTEMBER 25-28 • Association of Steel and Iron Engineers, Annual Convention, Penn-Sheraton Hotel, Pittsburgh. Association headquarters: 1010 Empire Bldg., Pittsburgh 22, Pennsylvania.

SEPTEMBER 27-28 • American Die Casting Institute Inc., Annual Meeting, Edgewater Beach Hotel, Chicago. Institute headquarters: 366 Madison Ave., New York 17, New York.

OCTOBER 4-6 • American Machine Tool Distributors' Association, Annual Meeting, Penn-Sheraton Hotel, Pittsburgh. Association headquarters: 1500 Massachusetts Ave., N.W., Washington 5, D. C.

OCTOBER 23-27 • American Society for Metals, National Metal Congress and Exposition, Cobo Hall, Detroit. Society headquarters: Metals Park, Novelty, Ohio.

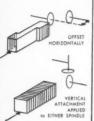
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September, 1961

MODERN MACHINE SHOP

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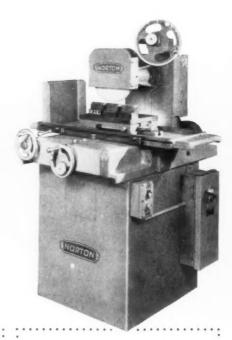
### Announcing

# New Norton Hand



NORTON 6 x 12" Type TS Hand Surface Grinder

Table travel up to 14". Cross traverse up to 7". Maximum height capacity 12½" a. Grinding wheel, 7" x ¾" x 1¼". Table traverse by hand through positive cable drive. One revolution of hand wheel moves table 65%", on friction-free ways.



NORTON 10 x 16" Type TS Hand Surface Grinder

Table travels up to 18", cross traverse to 11", grinding wheel 12" dia. Extended wheel head ways assure maximum grinding support and full use of 12" vertical\* capacity. Two-speed wheel drive. Fine cross-feed increments of .0005".

'Table top to bottom of full size grinding wheel.

## Surface Grinders...

Latest Norton developments...simplified, rugged, versatile...are welcome cost-cutters for your daily toolroom jobs.

Like all Norton grinders — from highly complicated automatic production machines to simpler toolroom types
— the new TS Type Hand Surface Grinders have the common denominator of precision performance, easy operation and long service life, built into them as follows:

Precision Performance. Two-speed wheel feed hand wheel has graduations of .0005" for fast, accurate positioning, plus a vernier scale graduated .0001" for precise grinding feeds. Rigid and long vertical slide and saddle design provide maximum support for moving parts, resulting in reduced vibration and better finish. Accuracy of center-guide cross feed is excellent for groove and shoulder grinding.

Easy Operation. Controls are at working height, for fatigue-free table and cross feed operation. Antifriction bearings under the table produce a smooth and easy motion for reduced effort. Table and cross slide controlled by hand wheels, with levers requiring crossed-arm operation when motions are simultaneous. These grinders are the only machines of their type with hinged wheel guard for quick wheel change.

Long Life. Anti-friction spindle is mounted in housing for rigid, rugged strength. Long vertical slide ways eliminate wheel "hang up" tendencies and provide large way areas. Deep saddle eliminates rocking, gives strong support for grind. Antifriction rollers cut wear on table and cross slide.

Over-all economy of Norton TS Hand Surface Grinders is strengthened by many features such as their uncomplicated, accessible mechanisms and clean, uncluttered design which reduce maintenance costs. For details on how these new Norton developments can cut your own daily grinding costs, see your Norton Man, a Trained Grinding Engineer. Or write to NORTON COMPANY, Machine Tool Division, Worcester 6, Mass. District Offices: Worcester, Hartford, Chicago, Detroit, Cleveland. In Canada: J. H. Ryder Machinery

Co., Ltd., Toronto 5.



75 years of ... Making better products ... to make your products better NORTON PRODUCTS: Abrasives . Grinding Wheels . Machine Tools . Refractories . Non-Slip Floors BEHR-MANNING DIVISION: Coated Abrasives . Sharpening Stones . Pressure-Sensitive Tapes MACHINE TOOL DIVISION: Norton Grinders . Lappers - G&E Shapers . Gear Cutting Machines

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#### PORTABLE 40-POUND BENCH MODEL 106

Here is a speedy, economical 2 or 3-dimensional engraver used by thousands of dollar-conscious companies. It features 5 positive, accurate pantographic ratios; ball bearing spindle with 3 speeds up to 14,000 rpm. Is supplied with one copy carrier that accepts all standard master type sizes. Will actually work up to 10" by any width. Height of pantograph and position of cutter are continuously adjustable.

#### MODEL D-2 HEAVY-DUTY 2-DIMENSIONAL

Pantograph for milling, drilling and engraving.

Vertical adjustment of copy table automatic with Pantograph. Features: unobstructed on 3 sides to take large work; micrometer adjustment for depth of cut; ball bearing construction throughout; spindle speeds up to 26,000 rpm for engraving or machining; vertical range over 10"; ratios 2 to 1 to infinity — master copy area 26" x 10"





# MEW MODEL D2-201 PNEUMATIC ATTACHMENT

for use with Model D2 Pantograph Engraver to rapidly drill holes in printed circuits by tracing templates. Drills as many as 100 holes per minute. Equipped with foot switch, spindle air cylinder, regulating valve and pressure gauge; filter and oiler. It's ready to use as soon as it's attached to an air compressor.

Write or call for full details and prices.

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September, 1961

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### "Rolling Your Own" CAN'T BE BEAT!

Not when it's on an ARDCOR Small Model "SF" Roll Forming Machine with a Model 10 ARDCOR Cut-Off Press.

There's no contest for low-cost, trouble-free production of small sections. An ARDCOR Model "SF" has all the fine engineering and sturely construction features that have made ARDCOR'S larger Roll Forming Machines the top recognized producers in the field.

Roll formed shapes can be produced faster, better and at lower cost with ARDCOR Equipment. Ask us for details and prices on single machines or complete production lines.

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ARDCOR

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Single Roll Forming Machines • Complete Automated Roll Forming Production Lines • Lock Seam and Electric Weld Tube Mills for Ferrous and Non-Ferrous Metals • Cut-Off, Pre-Notch Presses • Slitters • Straightening, Pinch, Leveller Rolls • Pipe Rolls, Tube Rolls, Forming Rolls

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## IT'S NEW IT'S VERSATILE IT'S AMERICAN

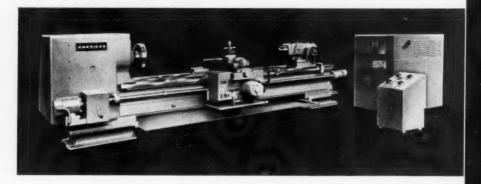
...and it's designed from the ground up to give you faster, more economical, more automatic production.

Here's a production athlete with both muscle and brains. A punched tape keeps it humming. Spindle speeds and feed rates are tape selected. Square tool turret is tape controlled. Lathe has hardened and ground cross and longitudinal Ball Screws. Six sizes (2010, 2413, 2514, 3019, 4025, 4732) swing from 21" to 47" over the carriage wings. 20 to 60 H.P. variable speed reversing motors drive heavy duty spindles. Tape preparation requires no computers. Simple. Easy to operate. Error free. Write for Bulletin 912-A-1.



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## Do you know what metallizing can do for you today?

#### With today's improved metallizing materials and methods:

PLANT EXECUTIVES find new ways to slash maintenance costs, reduce downtime, cut machine parts inventory...

JOB SHOP OPERATORS find new ways to build highly profitable business doing parts-salvage and maintenance work for plants in their area.

#### JOB SHOPS make good money with metallizing because they save good money for local firms.

Metro has prepared a special bulletin detailing actual operations and costs of typical flame spraying work on shafts, templates, bearings, many other surfaces. Use coupon to get your free copy.

## NEW! Business-building kit for job shops, to help Merco equipment owners build new business, pay off investment in minimum time, and use flame spraying to increase other machining and welding business. Contains samples of direct mail letters, post cards, envelope stuffers, photos, advertising mats. These promotion materials are available in lots of 100 at our cost, well below what you'd have to pay to print your own. One copy of kit available free—send for it today. (See coupon.)

#### These real-life examples show how plants save money, job shops make money with metallizing

Necks of winding rolls in a textile mill were formerly repaired by a slow machining method, requiring highly skilled labor. Now the worn necks are built up with flame sprayed metal, quickly machined to size. Savings run \$20,000 a year.

A job shop in California specializes in flame spraying oil well pump plungers, gets all the business it can handle in spite of the fact that the plungers it hard-faces last eight times as long as new ones. The largest ones cost only \$45.00 to rebuild, against \$110 to replace. Volume on just this one profitable metallizing service: \$35,000 a year.

Valve plugs and seats, working in sand, oil and salt water, lasted only a few hours in service. Hard-faced by welding, a set cost \$155, lasted from 3 to 8 hours. When flame sprayed with tungsten carbide powder, service life was increased to a minimum of 2 weeks, 4100% longer! Cost of metallized set, \$73. But reduced downtime far outweighs the dollar sayings.

A Connecticut job shop makes a very good profit when it flame sprays small







Any good mechanic can quickly master the three basic steps of metallizing: 1. prepare the surface; 2. flame spray; 3. finish.

shafts for \$27.50. The customer is happy, too—he formerly had to pay over \$50 to have shafts built up with welding.

The same job shop salvaged a big degreasing tank, value \$2,850, by flame spraying with zinc for \$683. The shop made money, the customer saved money.

A shipbuilding company installed metallizing equipment to repair such parts as pump rods, pistons, crank shafts for diesel engines, stern bushings, valve stems. A badly worn tugboat shaft, replacement cost \$3,000, was repaired and made better than new for \$400. That job alone more than paid for the Metco equipment.

From these cases you can see how modern metallizing pays, whether in plant maintenance departments or in job shops serving the many companies that don't need their own installation. Wherever there's wear, in rotary or sliding action, there's an opportunity to save money and make money.

#### New and improved materials

Among these new materials are a number of nickel, chrome, boron hard facing powders. Sprayed tungsten carbides are also widely used. Many others are available to give new values to the basic benefits of metallizing, which may be summarized as: less downtime; far less machining or grinding time, reduced parts inventory; and "better than new" performance of the metallized parts.

With savings like these there is plenty of leeway for good job shop profits and big savings for manufacturing plants. To learn more about these opportunities, check the coupon and send it off today.



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FORMERLY METALLIZING ENGINEERING CO., INC.
Flame Spray Equipment and Supplies

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#### Make work handling safer, faster, easier with self-contained lift magnets

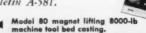
SIMPLE OPERATION permits any worker to handle heavy, irregularly shaped workpieces without danger or damage when conventional work-handling equipment is converted to magnetic lifting with Sundstrand "Power-Grip" lift magnets.

QUICK CONVERSION of job or overhead cranes from conventional to magnetic lifting because unit is self contained battery operated and does not require external power connections. Remote controls can be provided if desired.

SELF-CONTAINED POWER makes lifting power available in plant or out. Receptacle provided for trickle charger that brings battery up to full charge during idle hours. Dial shows charge condition.

THREE CAPACITIES available offer 2000. 4000 and 8000 lb. of lift. Power is supplied by conventional automotive type 6 and 12 volt batteries.

For more information, see your dealer or write for Bulletin A-581.









- Yard handling is simplified with remote operated lift magnets.
- Multiple unit using three magnets on beam for lifting sheet stock.



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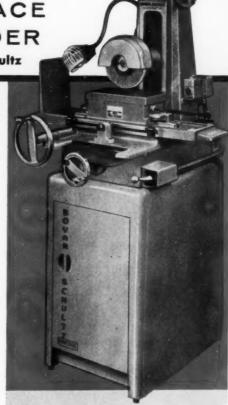
DE LUXE
SURFACE
GRINDER
by Boyar-Schultz

A De Luxe Boyar-Schultz Surface Grinder incorporating many new accessories for those who want the ultimate.

#### FEATURING

- AUTOMATIC OILING SYSTEM. A motorized lubrication system providing continuous flow of lubrication to all bearing surfaces.
- OIL HARDENED AND GROUND tool steel inserts on saddle ways.
- NEW WHEEL GUARD to accommodate an eight inch grinding wheel.
- SLIP RINGS ON HAND WHEELS for vertical feed and cross feed permit the graduated dials to be set at 0 or any other desired graduation.
- NEW HEAVY DUTY BASE with welded structural steel inner frame for maximum rigidity and increased weight. Also available with patented built-in dust collector.

6-12 De Luxe Surface Grinder is available with hand or hydraulic feed.



HIGH SPEED GRINDING ATTACHMENT — for grinding angles and slots too small to permit using standard wheels. Available at additional cost.



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gives details on Sunnen Precision Hole Gage and Size Setting Fixture combination. The set that measures to 1/4 tenths (.000025") without gage blocks or other setting masters.

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SHOW BENEFITS AND APPLICATIONS OF

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\*\*NEW ADJUSTABLE RAKE Manchester...
Cut-off Tool



Re-setting without losing center location. \* Eliminates grinding for proper rake angle. \*\* Available for all makes of Turret Lathes, Engine Lathes, Automatics and Cut-off Machines.

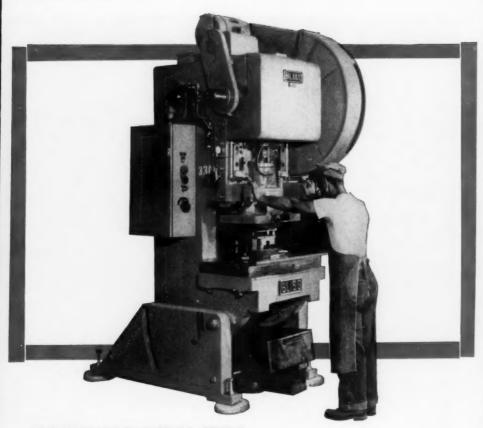
This new "Manchester" tool can save special tooling costs and time costs in special tool grinding. The tool is infinitely adjustable to any setting from 0° rake to positive 16°. Cutting point is always at center height regardless of rake angle to insure correct cutting action. Complete facts are available, write for literature.



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We made the plate for our customer for \$165.00. It arrived in his plant 6 days after he delivered a box of blank parts to us. With the plate went a tag showing Snow machine settings, and estimated hourly production based on the test run already made in our own shop. Time required for customer to set up the new dial plate was ten minutes! Standard universal Snow machines for drilling, tapping, or threading are available in vertical, horisontal or angular models. Their modest price will amase you. They reduce changeover time, and cut tooling costs to a ridiculous minimum. 28 different types of standard air-operated fixtures are available from stock. On your next job, let us show you what the Snow method can do. Submit samples and prints.

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SNOW master fixture

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• This Campbell wet abrasive cutting machine—the Model 406—will cut tubing, bar stock, angle iron, or any other shape up to 6" round or square—and it will cut practically any material, including the new super alloys and exotic metals.

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Ski-Kut END MILLS

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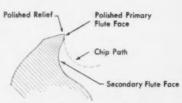
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Reduce tool room costs

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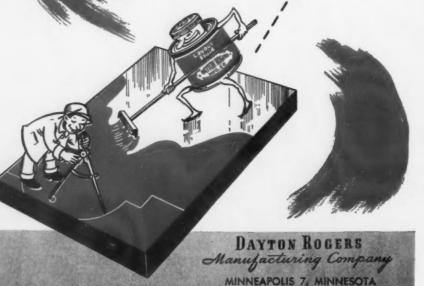
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"Not enough!" This is the most frequent answer. Why? Our recent field survey shows wrong blade type or wrong specifications used in over 50% of band-saw cutting. Solution—Choose one of the three blades developed by LENOX to cut fast and efficiently at lower costs. These LENOX blades fill every cutting requirement. HIGH SPEED STEEL.—For automatic cut-off equipment in full production work. Rapidly cuts most of the tougher steels. MASTER—BAND—Special alloy steel for standard equipment, cutting at semi-production or production rates. Also used on some automatic cut-off applications. DIEMASTER—Regular bands, cut-to-length or coil stock, for general purpose cutting. Interested in greater band-saw mileage? Get a true appraisal of your cutting needs by writing American Saw, Cutting Analysis Dept. Briefly describe your machine, materials cut, and type of operation. Recommendations and engineering help are furnished without obligation.

THE TOOLS IN THE PLAID BOX

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September, 1961

MODERN MACHINE SHOP

94



## "645" BETTER SIX WAYS

#### GREATER RANGE—

In EVERY category than ANY machine in its class . 251/2" of ram travel . Spindle to table and spindle to column-Range greatly exceeds competitive machines, PLUS many other dimension advantages.

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Ground lead screws . Hand scraped ways . Overrin stays in one plane . Locks without distortion . ool room accuracy in manufacture of components.

#### GREATER VERSATILITY—

Head tilts 45° forward and back, rotates 360° on ram Turret rotates 360° on column • Power assembly rotates 360° around spindle • Many other features.

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Convenient controls • 9 spindle speeds, 3 power spindle feeds (up or down) • 4-way head handles any compound work angle . Greater work area.

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Index quality throughout for long trouble-free life.

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MACHINE COMPANY **PHONE ST 2-6737** JACKSON, MICHIGAN

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#### The "cool" abrasive vital to ultrasonic machining...

### NORBIDE\* boron carbide

The Raytheon Company, leading manufacturer of ultrasonic impact grinders, defines the process as including: . . . . mechanical vibration at 25,000 cycles per second, above the range of the human ear . . . amplified and transmitted to the cutting tool . . . Tiny particles of abrasive are accelerated . . . and driven with tremendous impact against the work, thereby chipping or grinding an exact counterpart of the tool face into the work . . . This . . . together with the vibrating nature of the process, plus the absence of direct tool-to-work contact and the presence of the cool abrasive, make impact grinding a cool-cutting process. The work material is not stressed or distorted in any way, and is not raised in temperature."

Recommended by Raytheon, Norton NORBIDE boron carbide is the ideal cool-cutting abrasive for ultrasonic grinding.

Always recognized as second only to diamonds in hardness, and as much more suitable for ultrasonic impact than silicon carbide grain, this new improved NORBIDE boron carbide now has greater freedom from impurities—assuring longer lasting cutting power in each ounce of grain.

Your Norton Man will be glad to tell you how ultrasonic machining is being



Raytheon Ultrasonic Impact Grinders are widely used for slicing and dicing semiconductor wafers. Other machining operations include drilling, engraving, broaching, trepanning, shaping, shaving, lapping etc. Driven against the work with an impact force of 150,000 times its own weight, NORBIDE boron carbide grain is recommended by the Raytheon Company as the "cool" abrasive that meets every requirement.

applied in many manufacturing fields to a variety of materials—and how improved NORBIDE boron carbide can help you. See your Norton Distributor or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

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G-416

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NORTON PRODUCTS: Abrasives • Grinding Wheels • Machine Tools • Refractories • Non-Slip Floors

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## FASTER, accurate cut-off LONGER cut-off blade life SMOOTHER cut-off surfaces

#### WIDEST RANGE OF BLADE MATERIALS

- Empire cut-off blades are available in four grades of H.S. Steel (high-cobalt, high-vanadium). Range covers most any requirement for H.S. Steel tooling.
- Solid cast-alloy blades (non-ferrous, cobalt-chromiumtungsten) have high red-hardness, superior resistance to abrasion and are non-magnetic.
- Carbide tipped cut-off blades come in four grades of carbide
   -the best carbide for each job can be furnished.

#### SUPERIOR DESIGN FEATURES

- Faster Cutting precision grinding of all blade surfaces assures sharper cutting edges.
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- Cooler Cutting collapsed chips permit coolant to reach blade cutting edges.
- 4. Greater Precision blades are precision ground on all surfaces, centrality of head to shank is held to close tolerances.
- Smoother Cut-Off Surfaces sharper cutting edges, collapsed chips, better coolant flow, and liberal side clearances add up to smoother cutting.
- Longer Blade Life—wide selection of blade materials, finest blade design, resharpening on front face only, assures longer life on every cut-off job.

Made under license issued by John Milton Luers
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"NO OTHER HEAD OFFERS SUCH RANGE and VERSATILITY ON THE PRODUCTION LINE"\*

#### JARVIS UNIVERSAL JOINT MULTIPLE SPINDLE HEADS

\* For example, you can add to the basic head one or more of 20 optional accessories (such as Spindle Assemblies, Spindle Cluster Plate, Base Plate, Guide Rods, etc.) to meet the requirements of a particular job. With Jarvis Heads you have a greater selection of parts and accessories. A buy-only-what-youneed, custom-built head without having to pay the high cost of regular custom designed heads.

Universal joints are of an advanced structural design which feature: low deflection rate; superior fatigue resistance: greater overload capacity and longer life. Joints have a snap-on feature and can be slipped off the spindle without use of tools.



Cut-away view (below) reveals high strength, light weight aluminum alloy castings, heavily ribbed for durability; gears and spinde drivers run in ball bearings, have more than thrust load capacities; idler gears mounted on heavy duty needle bearings running on specially heat treated steel studs; adjustable outrigger arms locked in position with threaded studs located in double "T" slots

DOUBLE "T" SLOTS. NOT FOUND ON MOST OTHER HEADS. ADD RIGIDITY





#### NO NEED TO INVENTORY SEVERAL FIXED HEADS

Head converts easily to a fixed head by adding a Jarvis Spindle Cluster

Plate (shown below) which can be jig bored, by you or by us, to locate spindles to suit hole spacing required. Cluster Plates will aid in reducing setup time and will assure correct setup each time.



#### SEND TODAY FOR COMPLETE DETAILS

JARVIS CORPORATION,

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BURRING CLEANING FINISHING POLISHING

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TIME SAVINGS UP TO 50%

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GET COST-SAVING WORK-SAVING DETAILS NOW on the extensive applications of exceptional Brightboy. Write for the BRIGHTBOY CATALOG-MANUAL covering:

- Methods & Applications
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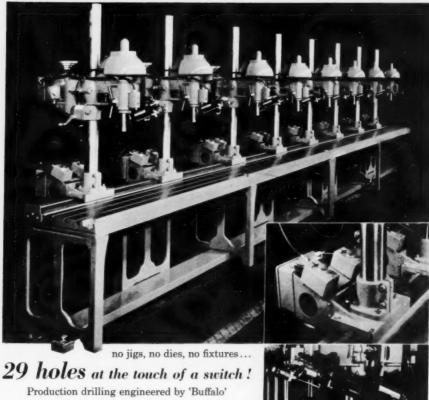
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PROBLEM: Drilling as many as 8 sets of holes in straight sections of aluminum channels to be formed into door and window frames, with varying hole patterns at exact locations to fit hardware and cross members of different size frames.

SOLUTION: A specially engineered 8-spindle 'Buffalo' No. 18 Drilling Machine with air-operated spindle 'Buffalo' No. 18 Drilling Machine with air-operated spindles and gear motor-positioned spindles mounted on 28-ft. T-slotted and dovetailed table. Two jogging push buttons on each head move it left or right to nearest \(\frac{1}{16}\)" by stainless steel scale and indicators. Thus heads may be set up quickly for any pattern with holes as close as  $12^{1/4}$ ". A single foot switch actuates all spindles simultaneously, though any air feeds may be legated out. may be locked out.

CONCLUSION: For fast, accurate, flexible drilling, there's a 'Buffalo' machine quality-built for the job, or 'Buffalo' can engineer one to your exact specifications. Let us know your problem!



TOP: Spindle closeup showing motorized racking device, scale and indicator.

BOTTOM: Showing air-operated spindle feed, rack, slide and clamping device.



MACHINE TOOL DIVISION

BUFFALO FORGE COMPANY

Buffalo, New York

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.









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September, 1961

MODERN MACHINE SHOP

100a

#### WHICH WAY TO BORE...

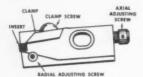
#### REGRINDABLES or

#### guaranteed performance makes it easier to decide . . .



#### Wesson Development Simplifies Tooling and Reduces Inventory Needs

Only 5 basic cartridges (18 options for rake angle and opposite hand) are required to assemble an unlimited variety of single or combination boring, turning and milling tools. Using throw-away inserts and incorporating both radial and axial adjustment, the cartridge fits in a keyway in the bar body or tool block.



Exclusive advantages not possible with any other form of tooling include:

Minimum Holder-Ports-Insert Inventory Unlimited Application Flexibility Lowest Tool Cost; No Grinding Precision Adjustment

For complete details ask your Wesson man or write for Bulletin C-660.

When Wesson recommends tools for your job, they are guaranteed to perform as specified regardless of whichever type tool is best for your application (Wesson makes both regrindables and throw-aways). This performance guarantee is possible because:

- Your local Wesson field engineer is an expert in boring, turning and milling with carbides (see examples at right).
- He is prepared to make a thorough, In-Plant Job Analysis of your applications and recommend the best tooling to suit the conditions.
- He follows through to make sure that the tools are installed properly, used properly and perform properly.
- 4) Behind every field man is the extensive experience and facilities of Wesson's 4 specialized tool plants, basic research, application research and tool engineering groups and Wesson's own carbide metals plant.

A Wesson In-Plant Job Analysis—at no cost to you—enables us to make a sound recommendation based on all the facts. Call your Wesson man in—if he can improve your operations he'll give you a detailed description of how—if he can't improve them . . . he'll tell you that too!

In any case, call him now and ask for your copy of the new 8-page booklet, "How to Bore with Regrindables or Throw-Aways". (Or write us, if you prefer.) This booklet can be of considerable help in planning boring operations.

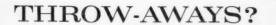
Wesson Corporation, 1220 Woodward Heights Blvd., Ferndale 20, Michigan. In Canada: Wesson Cutting Tools Ltd., 93 Judge Road, Toronto 18, Ontario.

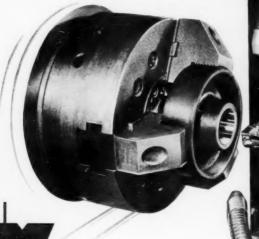
· WESSON CORPORATION

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After failure of all other boring tools tested, this company asked the Wesson field engineer for a job-analysis study. Result: a standard Wesson PAS (positive-rake) boring bar with Wessonmetal WH inserts now bores these hubs at a rate of 160 pieces per insert.



Tool life extended from 8-hours to 12-weeks and tool adjustment time reduced from 2-hours to a few minutes . . . that's the Wesson record on this scalping mill. Wessonmetal GI inserts (in locator-anvil units) are micro-adjustable to permit quick setting of face runout.



Severely interrupted cuts can impose excessive tool shock loads. A Wesson In-Plant Job-Analysis recommended multiple tools—with successive tools taking identical cuts. Two tool blocks—each with five throw-away insert holders—now turn out 450 pieces per set of inserts.

AITH . WESSON CUTTING TOOLS LTD.

## **NEW FROM HANNIFIN** A GENERAL PURPOSE AIR CYLINDER

that gives you quality, low cost and mounting versatility

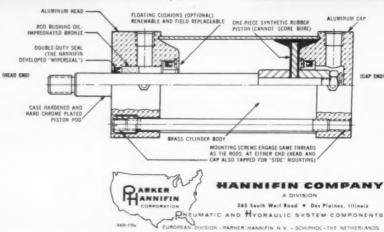
Hannifin announces a new design concept that gives you quality and economy in one



- One compact basic design that provides side, cap end, or head end mounting without modification.
- Flange, foot or pivot mountings easily made with standard attach ments.
- Rust proof construction brass cylinder body, head and cap of aluminum.
- Cushions that do not change cylinder length — furnished as option or ailded in field with simple kit.
- An ingenious one piece piston that cannot score the bare—of synthetic rubber, molded around
- Piston rod both case hardened and hard chrome plated, polished to a fine linish for low friction and long seal life. Corrosion resistant.
- Rod bearing an oil impregnated bronze bushing. Minimizes friction.
- Gland seal the Hannifin developed
   "Wiperseal" both a rod wiper
   and an efficient dynamic seal. It
   keeps air in, dirt out.
- 8 bere sizes—1¼", 1¾", 2¾", 3¾" and 4½". Stock strokes from 1" to 20" in 1" increments.

This new Hannifin cylinder design is the latest of the complete Hannifin line of air power cylinders. To help you choose the best Hannifin cylinder for your application, talk to your nearby Parker-Hannifin man. He knows cylinders!

package, the new Series "C" air power cylinder with .



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#### modern machine shop

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For printing products, parts and materials, several STANDARD and a whole series of special machines have been developed by ACROMARK® Engineers. Inks of both liquid and paste types have also been developed for successfully marking metal, plastic, rubber, wood, paper and other materials in a wide range of colors.

#### ACROPRINTER® Model 401-A

An air operated machine that fills sunken lettering with color or prints any product with name, number, design or trade-mark.

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## OVER THE EDITOR'S DESK

Vogel

FRED W. VOGEL

#### WAITING TO BE UNDERSTOOD

Sometime back, we cannot remember just where or when, a clever wit composed a cartoon depicting one of the marvels of our current age, a mammoth data processing computer liberally endowed with dials, switches, handles, controls, lights, and various instruments. A sweet young thing approximately 36-22-36 had just passed by and the operator was extracting from the output section of this computer a slip of paper containing the single word "Yes."

We feel that, although indelicate, this is a cogent illustration of the rather extensive and erroneous belief quite commonly held that the amazing new developments in the computer and automation fields are thinking mechanisms with human attributes which are smarter than people and have capabilities that will replace the need for man's creativity, intelligence and intellectual capacity.

Any experienced computer user will be quick to inform you that while the machines have tremendous capacities for making a myriad of calculations at an almost incredible speed with astounding accuracy, they lack any ability to think. The computers cannot do anything until they have been properly programmed and fed the working instructions. In the hands of the engineer or the person in charge of processing vast volumes of paperwork, the computer has become an invaluable tool to assist in completing tasks that could not otherwise be done because of their complexity, time element involved, or excessive costs.

Today we are witnessing an equally significant and revolutionary development for the metalworking shop—the numerically controlled machine tool. Like the computer it lacks the element of human intelligence but as the computer did in its field the numerically controlled machine will definitely

# H'S A FACT!

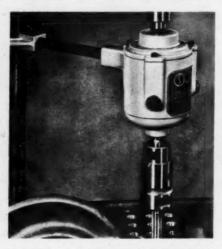
You can tap 1/2" holes with a light drill press and Supreme's New VersaTAPPER



Shaft of Model 6100 is held in drill press chuck. No. 6200 (above) has Tapered spindle.



Supreme Accutap Chuck is standard equipment with VersaTAPPER. Capacity 0-1/2"



VersaTAPPER is a compact precision-made tapping unit. Fits any drill press... features half-inch capacity range plus 4-time increase in torque. Easy to install. Simple and quick to remove after use.

VersaTAPPER... operates easily in any material ... with widest capacity range ... yet costs far less

COMPLETE

The new VersaTAPPER has scored an instant success with production people everywhere. It has more versatility than other tapping devices. It has the widest capacity range-from 0 to 1/2", but depending on application, use of taps smaller than No. 10 is limited. It develops more power - makes the tapping of 1/2"-13 holes a simpler matter, even with

light duty drill presses. VersaTAPPER is simple to use-can be successfully operated by anyone in your shop.

All of these features at the remarkably low price of \$63.00 complete marks VersaTAPPER as a product you must see at the first opportunity. It's available at your local Supreme Chuck distributor. Call him soon.

PRODUCTS CORPORATION

CHICAGO 16,

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You get more from power tools with **Top Quality Supreme Accessories** 



#### Supreme Brand Chucks

Noted for unmatched quality. The widest range of sizes and types...one for every machine in your shop. Exclusive Su-preme hardening means greater accuracy-longer wear.



Supreme Versamatic

Reversible speed reducer for portable drills. Fits all makes -permits their use for power screw driving, nut running and heavy duty drilling. 7 to 1 reduction means high torque increase. A fine tool.



#### Supreme Push-Pull Tapper

Like the Versamatic, but made for the single purpose of tap-ping with portable drills. Reverses instantly for tap removal. Handles taps up to 5/16° diam-eter. Top quality. Simple to

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> CALL YOUR DISTRIBUTOR

PRECISION ASR PRODUCTS

## Over the Editor's Desk . . .

offer itself as a new tool that will serve its user by reducing costs, lead time, machining time and also offer complete new areas of productive capacity and management opportunity through its inherent ability to follow with optimum speed and accuracy the instructions that have been given to it. It can be said with conviction that numerically controlled machine tools represent one of the most significant advances in the metalworking arts since the concept of the interchangeable parts.

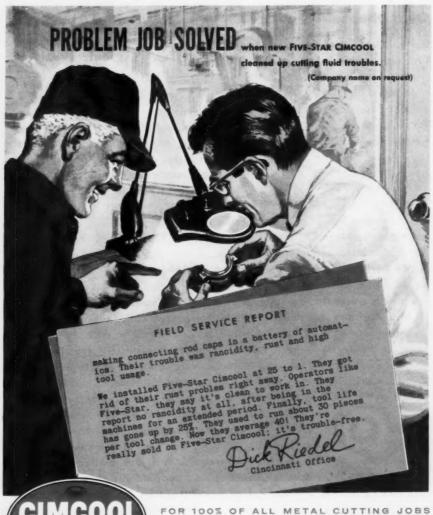
As we survey the developments and see the successful installations of numerically controlled machine tools we are convinced that the first step toward realizing the potential they have to offer is to have a realistic understanding of what they are and the basis upon which they operate. Toward this end we have developed a series of articles that concern themselves with basic fundamentals of numerical control machine tool operation. The first of these articles starting on page 116 explains definitions, composition and the potential areas of the profitable use of numerically controlled machine tools.

One of the principal tasks facing the man in charge of metalworking operations is the understanding and proper evaluation of equipment and methods. We dedicate this series to the person who is looking toward the future and will spend a few minutes each month acquiring basic insights into what the future most certainly will bring.

#### MACHINE TOOLS-WEAPONS OF RED DIPLOMACY

What are some of the particular techniques the Russians use to cement relationships between the underdeveloped nations and the Communist bloc? Machine tool and distributor salesmen who attended the Machine Tool Sales Conference at Purdue University in late July heard Professor of Industrial Engineering, O. D. Lascoe, declare that the iron curtain countries are turning out excellent, basic machine tools with simple controls, the best of which are going to the underdeveloped areas of the world. Naturally with the machine tools go technicians and training personnel who create and build up the personal relationships that are all part of the overall plan of establishing commercial, cultural and intellectual ties with the Communists.

Professor Lascoe pointed out that the main design emphasis is directed toward building good quality, reliable machine tools with a minimum of controls so that successful operation can be attained by persons who have



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For full information on the complete family of CIMCOOL Cutting Fluids, call your CIMCOOL Distributor. Or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

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September, 1961

MODERN MACHINE SHOP

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# Over the Editor's Desk . . .

never before dealt with industrial machinery and to whom high rates of production are not nearly as important as the ability to turn out the first production item.

Included with the talk were slides taken in Poland of several types of machine tools manufactured by the various Communist bloc nations. It is Professor Lascoe's opinion that while the satellite countries of Poland, Czeckoslovokia and Hungary are producing some high quality machines, the Russian machine tools on exhibit did not compare with the satellite machine tools. Professor Lascoe was technician in charge of the United States machine tool exhibit at the trade fair held in Poznan, Poland last year.

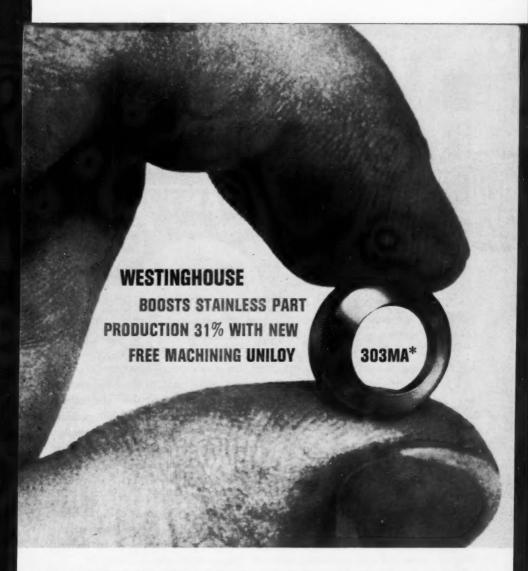
He suggests that as the United States turns increasingly to the numerical control and other more sophisticated types of metalworking equipment—something the Iron Curtain countries have not even seriously begun according to the latest information—that our lower production but mechanically sound machines be made available to underdeveloped nations on a basis that would create the same results now accruing to the Reds through their program. It is worse than nothing, observes the Professor, for the United States to ship machines overseas without highly trained college level technicians.

A sound program would have qualified personnel go with the machines to see that they are properly installed, operators adequately trained, and the ability to indoctrinate our own manufacturing concepts. This seems so basic, yet we seemed to have failed far more often than we should have. The results of such a program would, of course, be mutually beneficial in that the recipient nation would have equipment that is actually producing and we would have established the personal contact with the technical level of persons by our training personnel and further lines of communication and exchange would, of course, be maintained by machine tool representatives in the furnishing of maintenance parts, additional technical data and attitudes of men in a dynamic free western society.

## IMPROVEMENT KNOWS NO SEASON

During the recent summer months it seems that we received a larger amount of letters, catalogs, news releases, new equipment writeups, and so on, than for any other comparable period of time. Naturally, it caused us to question why this should be so. One conclusion, and the one which we believe is true . . . an unmistakable pressure is building up to improve facilities and thereby make our industries as productive as possible.

106



The Westinghouse Standard Control Division at Beaver, Pa., compared New free machining Uniloy 303MA\* stainless steel with regular Type 303. The part—a close tolerance spring end support for circuit breakers and control equipment—was machined from ½-inch stock. Here are the production line results:

	AISI Type 363	New Uniloy 303MA
Spindle Speed	890	1180
Surface Ft. per Min.	115	155
No. Pieces per Hour	110	144
Tool Life	Form tool sharpened	Form tool sharpened

New Uniloy 303MA also machined cleaner and smoother to produce higher quality parts. It is now specified in all \*U.S. PATENT NO. 2,900,250

applications formerly calling for Type 303 stainless steel at this plant.

Cut your production costs! Order New Uniloy 303MA at your nearest Universal-Cyclope steel service center or sales office. Ask for your copy of the "Uniloy 303MA" brochure.



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- THE CURRENT PAUSE IN THE RECOVERY IS ONLY TEM-PORARY, say economists in government and industry. They see no cause for worry or change in plans. The pause is normal . . . a breathing spell . . . typical of every business upturn. Indeed, the analysts have been expecting some slowing of the Spring tempo. They are also expecting the breather to end very shortly-with the Summer. The causes of the Summer slowdown were partly seasonal—the result of vacation shutdowns in steel and other lines, early model changeovers in autos, etc. The breather is also a by-product of the upturn's first phase; a switch from inventory liquidation to accumulation can lose momentum temporarily while waiting for consumers to react to job and income gains. The Fall improvement will come from three main factors: Business itself will provide lift through stepped-up outlay for inventory, research, and for new plant and equipment. The consumer will respond to longer workweeks, high wages, and new jobs by swelling spending-especially for durables. Federal spending will be the most important -largely those extra billions in defense expenditures prompted by Soviet Russia's repeated and menacing saber-rattling over Berlin.
- CONSTRUCTION MAY PROVE TO BE THE BIG SLEEPER of this business rise. It hasn't been getting much attention, but it's roaring along at near-record rates—and at the highest clip in two years. What's more, there are good prospects for substantial increases to come. Spending for public works is up 10% over 1960—mainly highways. Private building is trailing '60 by 2%. Much of the lag is a result of the recession-caused slump in home-building. But home-building is now picking up. Lower mortgage



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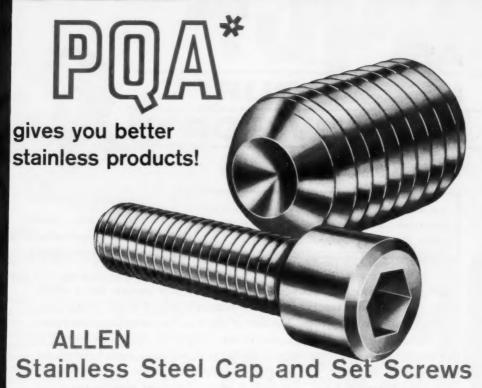


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# Report from Washington . . .

rates—and the huge, recently passed housing law—will give demand a big stimulus, with the bulk of the impact hitting in 1962. Home-building helped turn several earlier upturns into booms.

- DON'T RULE OUT A STEEL PRICE INCREASE later this year. To be sure, the Administration is putting pressure on the mills to hold the line; and foreign and domestic competition may keep the lid on a few scattered items. But, despite threats of new Congressional anti-monopoly investigations, the producers may find themselves forced to lift prices by new cost increases. The companies must increase wages for the third time under the contract signed early last year. Up to now, they have absorbed the hikes, but profit margins are already squeezed. Higher steel prices would lift costs for a big range of U.S. industries—autos, appliances, machinery, and construction.
- PRICE AND WAGE CONTROLS ARE BEING STUDIED by government officials for possible enactment by Congress on a stand-by basis in the Berlin crisis. They're not ready to ask for the power, knowing that Congress won't give it short of shooting. But the experts want to determine what would be needed. Officials see the central problem as a two-phase affair—the steps needed to check a scare-induced upsurge of inflation, and then such long-term curbs as rationing and credit lids.
- THE BIGGEST LABOR ORGANIZING DRIVE IN U.S. HISTORY is being charted by James Hoffa, recently reelected President of the huge Teamsters' Union. His membership has just voted him broad new powers, plus a large war chest. Hoffa's immediate target is a 300,000 increase in his membership—from the 1.5 million or 1.7 million figure that's variously attributed to the Union. The Teamsters will invade new areas—even in manufacturing. Targets will include plants in apparel, textiles, plastics, and in electronics. In general, Teamster organizers will go after virtually any group that's unorganized and organizable.
- NEW PROPOSALS FOR HANDLING BIG LABOR DISPUTES will be pushed hard by the Administration and Labor Secretary Goldberg, the proposals' author. They're meant to give the government flexible alternatives to injunctions now called for under the Taft-Hartley Act—something Democrats have wanted.



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# AS

# I SEE YOUR SUPERVISORY PROBLEMS

For answers to your perplexing managerial problems address your letters to Mr. Alfred M. Cooper, MODERN MACHINE SHOP, 431 Main St., Cincinnati 2, Ohio.



By ALFRED M. COOPER Consulting Editor, Modern Machine Shop and author of "How to Supervise People."

Under our existing economic setup there are certain facts which every executive and supervisor in our industries should make crystal-clear to every industrial employee. The first of these is that, in order to maintain our high standard of living under present reciprocal trade agreements, it has become mandatory that many of our large corporations must build plants abroad. This has given rise to a lot of unfair accusations that the United States is "exporting jobs." The truth is that it has been possible for many corporations to remain in business only by building such plants. It is also true that management has shown keen judgment in thus meeting unfair competition in this manner.

Mr. John T. Connor, President of Merck & Company, gives illustrations of this problem from the pharmaceutical manufacturer's point of view. His comments will apply equally well to other major industries. Thus, with our almost non-existent tariffs, it often becomes impossible to pay high wages and still compete with foreign imports.

Since 1945 the United States has been the wealthiest nation in the world, and has attempted, by slashing tariffs and through straight giveaways, to help the unfortunate nations, among both our wartime allies and enemies, to get them on their feet again. Thus, for 16 years, we have played Santa Claus to every nation in the free world, and the results are now becoming apparent. These nations are now flourishing.

President Kennedy's newly created "Committee of 21" is making a careful study of this situation, with a view to creating a new tariff schedule which will give our haressed manufacturers an opportunity to compete on



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# Supervisory Problems . . .

more favorable terms with all other nations. This, as Mr. Connor points out, will permit him to pay skilled workers in his plants \$3.60 an hour as compared to Italy's 89 cents an hour for comparable artisans.

Management has been criticized for building plants abroad at a time when this was the only possible method of maintaining our standard of living in this country. Merck & Company, for example, have found it obligatory to build 14 such foreign plants, and often have been able to export raw materials, process these abroad, and then import finished materials to the United States and sell them at a much lower price than if they had been manufactured at home. Mr. Connor cites one instance in the so-called reciprocal trade agreements in which Peru placed a flat ban on imports of any type. In this instance his company was forced to build a plant in Peru or lose all trade with that nation. Many other corporations have been faced with this same problem.

The profits from the operation of these plants have been returned to America, and much of this money has been put into research work, so that we could keep ahead of foreign new developments and methods of producing quality products at less cost, both here and abroad.

Mr. Connor further compares production costs here and abroad by stating that top-notch secretaries in England are paid \$120 per month, in Italy \$150, and in the United States \$400. Almost any college graduate in America can expect to go to work at once at a salary of \$6600 a year; in England at \$1680 per year.

All of the foregoing is what has made of the "reciprocal trade agreements" a sort of giveaway program intended to give the nations who suffered most in World War II a chance to get back on their feet. It was the generous act of a victor in extending a hand to those who were down and out. The problem is when to cut down on giveaways of this sort before our standard of living has been irreparably injured. Another organization that will study this problem is the newly organized O.E.C.D., a 19-nation board to study a revised plan for trade agreements. Out of this should come a more equitable arrangement on export and import duties.

It is now time to set about making our industries stronger, in order that we can continue to give aid where it is needed. When that time comes there will no longer exist the necessity for "job exporting." We have done a fine job of holding up our standard of living while still getting all the worst of it in maintaining a fair export-import balance.



An ARMSTRONG Wrench feels right—is balanced. It goes over nuts or screw heads easily, grips firmly without sloppiness, won't round corners—because openings are carefully machined to correct sizes. It's safe, strong beyond need without clumsy bulk—because of superior design and selected steels, heat treated to proper degree of hardness and tensile strength. It's quality finished, ARMALOY (alloy steel) Wrenches in chrome plate with heads buffed; HI-TEN

(carbon steel) Wrenches in baked-on gray enamel with heads ground bright...all plainly marked for size. All are uniformly excellent tools manufactured under strict quality control, by modern methods, with modern equipment in a modern tool plant...1537 different industrial sizes and types—single wrenches, or sets in metal cases, boxes or rolls...each a quality tool. Armstrong Wrenches are "Fine tools that encourage good work."



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Associate Editor, Modern Machine Shop

Today a new wind in the form of numerical control of machine tools is blowing across the metalworking industry. The tremendous potential of the new development naturally brings to the mind of the prospective user many questions as to just what is it, how can it profitably

be used, how are the programming techniques mastered, and what other considerations are there in bringing numerical control to its best utilization?

This first article, in a series that will discuss the major areas of numerical control and the programming techniques, will define numerical control and list the areas of its potential profitable use. The material for these articles was derived from course material developed for the American Machine Tool Distributors Association and from interviews of personnel of the Boeing Applied Computing Services of Wichita, Kansas (Fig. 1).

Originally numerical control was developed to meet some of the growing problems in machining the increasingly complex parts and components of modern aircraft. For this reason the more sophisticated machines preceded

the simple units now predominating the market today.

The objective of this series of articles is to familiarize the reader with some of the fundamentals that comprise numerical control so that it can be considered and regarded as the powerful new resource for all metalworking shops that it is and not as something mysterious and abstract.

By definition numerical control is the operation of machine tools by numbers. This means that numbers, converted to a form that can be utilized, direct some or all of the operations of a given machine tool which range all the way from controlling the position of the spindle in relation to the workpiece to the flow of the coolant. The numbers are instructions in the form of codes which refer to a specific distance, position, motion or function that the machine tool will act upon.

With the conventional method of machining a workpiece, an operator studies an engineering drawing and guides a cutting spindle, for example, according to the information

on the drawing. The successful operation of the tool depends in large part on the skill of the operator. With numerical control, the drawings are studied and then the information on the drawings is converted to the appropriate code numbers by a person known as a part programmer (Fig. 2). The code numbers represent every movement. path, or action the machine tool must take to properly machine the piece called for in the engineering drawing. The complete series of codes necessary to produce a single part on a machine tool is known as a program.

Machine tools cannot read numbers themselves. The actual reading

Fig. 1—Boeing Applied Computing Services offers consultation, personnel training, and program development to current as well as

to prospective users of numerically controlled machine tools. BACS is located at the Boeing Company's Wichita, Kansas Division.



## "The control unit is comprised of electronic controls . . ."



Fig. 2—A part programmer studies the engineering drawing and lists the machine operations on a program sheet. The program sheet is then given to a clerk who prepares either a punch tape or a deck of punch cards

which are the media for the control unit of the machine tool to be used. In this particular illustrated instance, the program steps were fed to a computer which developed the final control media in punch tape form.

of the properly coded instructions is done by a tape reader which is part of the machine tool control unit. The control unit is usually comprised of a group of electronic controls which can "read" or "sense" the properly coded instructions as they were developed by the programmer. Once the instructions or codes are "read" they are, by various means, converted to the mechanical movements of the machine tool through devices known as servomechanisms.

The number codes that a control

unit can read may be incorporated in punch tape, magnetic tape, or punch cards. This depends entirely on how the control unit was manufactured. Punch tape, as shown in Fig. 3, which is one of the more predominate types of control media, is one inch in width and is provided with eight "channels." In these channels, holes are punched in the appropriate places to indicate numbers. These holes are then "read" by the control unit with either fingers, brushes, photo-electric beams or vacuum sensing through

the holes to complete electrical circuits which will set up electrical contacts. The old fashioned player piano used the same principle that is now used by control units. As the holes in the player roll passed over the sensing bar, air was drawn into tubes which went to individual piano key activating mechanisms. The analogy here is about like comparing the original Wright airplane

to a modern jet aircraft but it serves sufficiently to illustrate the control unit principle.

Magnetic tape is the same type that is used on the ordinary musical or voice tape recording unit. The tape is coated with bits of ferrous oxide which when magnetized will give electrical impulses when passed over a reading head. These pulses go through the control unit which

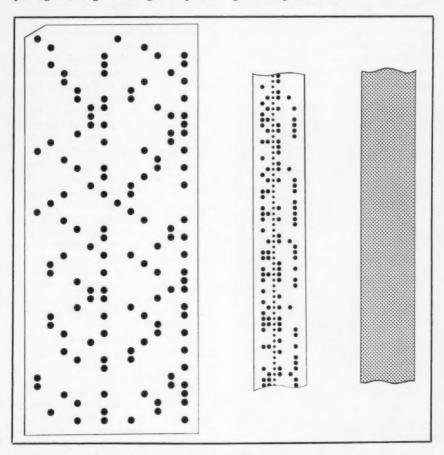


Fig. 3—Control media containing necessary coded machine tool instructions may be punch cards, punch tape, or magnetic tape. Media used is determined by manufacturer of control unit.

#### "Numerical control is not a mechanical brain."

converts them to energy and then ultimately to machine tool motion.

Punch cards have become prevalent in everyday use. Examples are the government income tax refund checks or magazine subscription notices which are written on punch cards. These are also known as tabulating cards. The holes in the card are either numerical or alphabetical codes and a proper machine can read the codes and then add. tabulate, calculate, and make computations according to the type and capacity of the machine. Likewise



Fig. 4-Profile mill operator clamps circular workpiece to holding fixture. Clamps can be loosened and part removed in seconds.

the proper machine tool control mechanism can "read" a program comprised of punch cards and then properly direct the machine tool to execute the specific machining or processing operation.

Numerical control is not a mechanical brain. It will not think, nor is it any form of magic. It is not a development whose understanding is exclusively the province of graduate engineers. It is not something that is practical for only the largest plants with quantity output. There are job shops today with less than 20 employees making profitable use of numerically controlled machine tools. In experimental training, high school graduates have qualified as operators in as little as two weeks time. The all-important part programmers need not be engineers and present experience indicates that the most successful development of part programming personnel comes directly from the production shop. The most successful ingredient in the successful programmer is an enthusiastic attitude and a willingness to learn, coupled with a knowledge of machine tools and machining practices.

In actuality a numerically controlled machine tool is a slave. It will do precisely and exactly what it has been told to do and it will do this with optimum speed, accuracy, and consistancy without hesitation. The only limiting factor is the capacity of the unit. A slot to be milled which is 36 inches long cannot be programmed on a machine that has a 24-inch maximum movement. Similarly, if a spindle has a maximum of 1800 r.p.m. there is no control unit that can make it turn 2400 r.p.m. even though the control unit has been so programmed.

Since the non-thinking slave concept is a realistic approach to the operation of a numerically controlled machine tool, the programmer has the unique responsibility for obtaining the correct results. Since every motion, dimension, and operation must be told to the machine tool, it falls on the shoulders of the programmer to accurately specify each of these items of information with complete accuracy and in proper order.

Since the entire unit is a completely subservient, dependable, and non-thinking slave it offers the programmer the complete confidence that his program will be carried out exactly as he had developed it whether it be one or one thousand times. This program will be carried out at optimum speeds, with the accuracy inherent in the unit and in a completely predictable amount of time.

Numerical control machine tools are not different in the sense that new machining concepts are involved. They may be multi-purpose with several operations such as drilling, milling, tapping and boring built into them. The principal distinguishing feature about the machine tool itself is that it is constructed with enough rigidity and accuracy to accept and execute the rapid and extremely precise instructions that control units can deliver. Since a control unit can deliver instructions at a much greater rate of speed than can be done manual-

ly, numerically controlled machine tools will actually be cutting metal a much higher percentage of the time than a standard machine. Control unit manufacturers can produce units that will deliver instructions involving movement as little as one millionth of an inch. This, of course, is much finer than any existing machine tool can execute and points up that the limiting factor of tolerances is the machine tool and not the control unit. It is for this reason that very special consideration has to be given to the machine tool that is married to a numerical control unit.

The role of the operator is altered



Fig. 5.—Approximately 30 seconds are required for this operator to load and thread punch tape in the control unit of profile mill.

# "Final output does not depend on operator skill."



Fig. 6-Operator compares finished part with the unfinished part on the machine. All of the profile mill operations necessary to produce this part were directed by means of the control unit which received its instructions from the punch tape shown in Fig. 5.

since his function is to load the workpiece properly on the table. place the control medium in the control unit and start the cycle of operations (Figs. 4 and 5). The final output does not depend on the operator skill. An average operator can become a very excellent one when utilizing a numerically controlled machine tool. He has the responsibility for checking against any malfunctions and should be

trained to "feed back" information to the programmer to simplify and improve programming techniques.

While numerical control is not a "cure all" or "magic" it is a development that is growing rapidly and will continue to do so because of its inherent advantages. These advantages cover eight general areas and if any one of them applies to your situation, a thorough investigation of numerically controlled machine tools should be made as soon as possible since either economic or competitive conditions will force this evaluation at some time. These eight areas which apply regardless of the size of the metalworking shop are:

(1) The shop with many setups. One of the most dramatic areas of cost reduction using numerically controlled machine tools has been in this area. Many jigs and fixtures have been reduced or completely eliminated. In nearly all instances a few clamps are all that is needed to hold a workpiece. The control unit properly guides the cutting tool. There are instances where the cost of numerically controlled machine tools has been made up by savings in this area alone.

(2) The shop with many complex machining operations. With the resources of program preparation and the capabilities of modern machines the complex operations can often be done more quickly and at less cost with fewer set ups than can be done manually.

(3) Where the situation exists that the machining time is low in relation to the setup time. This is so because numerical control has been very outstanding in simplify-

ing setup requirements.

(4) Where the need exists to shorten lead time. If tooling, fixturing, and template requirements are greatly reduced the savings here are obvious.

(5) Where a part is complex but must be made in short runs with variations. It is much easier to modify a program than to make new or modified tooling accessories. If a program is contained on either punch or magnetic tape modifications can be made by taking out the old portion and inserting the new. If the program is contained on punch cards the old ones are simply removed and new ones inserted in the proper sequence.

(6) Where a part is so complex that human error is likely to occur. Once a program has been correctly

made it will work without error indefinitely barring a malfunction of the machine tool or control unit. Today both are manufactured with a very high degree of reliability and in many units, should a malfunction occur, the machine will stop before

damage occurs to the part being

machined.

(7) Where design problems are such that an adequate inventory of parts would be costly. It is much easier to store a series of programs in the form of tape or cards than it is to warehouse a quantity of parts and the necessary jig and fixture components to manufacture them. This is becoming an item of increasing significance and has resulted in remarkable savings for the aircraft industry.

(8) When competition is getting the work done more quickly and at a lower cost because of numerical control. This perhaps is the most significant of all the reasons and one which more and more plants are facing with a sharp realization.

\* modern machine shop \*

Grinding Stresses. The Grinding Wheel Institute has announced publication of an 81-page booklet "Grinding Stresses: Cause, Effect and Control." This booklet comprises the collected papers which have been published as articles in the trade press, and is based on research sponsored by the Grinding Wheel Institute and the Abrasive Grain Association at Mellon Institute. Copies are available by writing, on company letterhead, to Grinding Wheel Institute, 2130 Keith Building, Cleveland 15, Ohio.





By KENNETH J. MILLER
Welding Engineer, AiResearch Manufacturing Company
Division, The Garrett Corporation

How Electron

Beam Welding

Facilitates

High Pressure

Vessel Production



Author discusses the principle of the electron beam welding process and some of the results obtained with same.

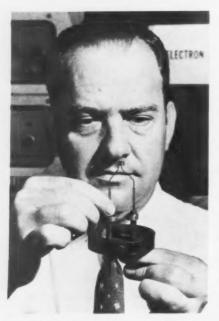
(Upper left) View of electron beam welder from control panel side. Note large, heavy plate glass observation window. Small hand control panel is used to control electron beam within three inches in any direction. Automated weld positioner in the vacuum chamber moves weld joint through this limited electron beam control area. The voltage and amperage used controls the amount of heat generated and penetration of electron beam.

(Left) General view of an electron beam welding setup. The vacuum chamber in which welding is accomplished is at the upper left. The tube or "gun" which produces the electron beam pretrudes from the top of the chamber. Note the tracks in the chamber far automated weld positioners. Pumps for evacuating chamber and tube are at the right.

When The Garrett Corporation's AiResearch Manufacturing **Company Division** at Los Angeles received a contract from Lawrence Radiation Laboratory to produce spherical ultra-high pressure vessels for containing liquid gas mediums at pressures ranging between 10,000 and 20,000 p.s.i., it introduced a fabrication difficulty which, in final solution, lead to an entirely new product line. The fabrication difficulty was in welding the Hydroformed or forged hemispherical pressure vessel halves together in a manner to withstand the tremendous strains involved. The difficulty was solved by obtaining an electron beam welder. The résults were so satisfactory that AiResearch is now producing electron beam welded pressure vessels for many and diverse experimental and production projects.

At the time the AiResearch elec-

#### ". . . fusion is accomp'ished in an almost complete vacuum."



The author inserts a new filament in the electron beam tube filament holder. Each filament will last approximately a week under normal production conditions. Electrons emitted by this filament, when heated, are electromagnetically "focused" on material being welded. The impact of the electrons on the material generates the welding heat.

tron beam welder was obtained. there were only two similar machines in use in the West Coast area, and about a dozen in use across the nation. This scarcity implies that many interested shop people have not had the opportunity to see an electron beam welder in operation, watch how it works, and note the results obtained. This article is intended to throw some light on the subject.

Basically, in electron beam weld-

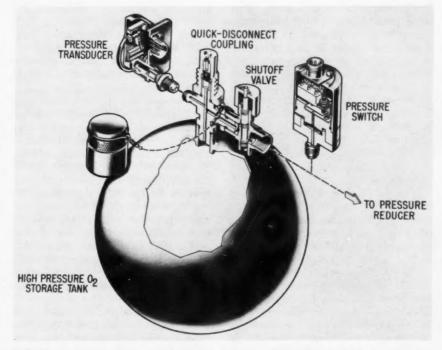
ing, electrons emitted by a hot filament are electromagnetically "focused" in a vacuum chamber on the material being welded. The energy imparted by the electrons as they strike the material generates the welding heat. Because this beam can be focused on a very small area. from 0.020 to 0.040 inch in diameter. and when sufficient voltage is used, the intensity of the heat in this small area becomes very great. Though exact ultimate temperature figures are not available, suffice it to say that a properly focused beam will fuse through carbon and carbides, and will quickly melt most refractory super alloys including titanium, tantalum, colombium, molybdenum, udimet 500 and Rene 41.

Aside from the elevated welding heat available, the paramount advantage of the electron beam welder accrues from the fact that fusion during welding is accomplished in an almost complete vacuum. This eliminates all air or gas-borne impurities from the weld. Even quite dissimilar metals can be fused together with no chance at all for unwanted alloys to form by gathering substances from surrounding air or gaseous mediums.

Another distinct advantage accrues from the very small area upon which the electron beam can be focused. This, combined with the quickness of heating, and the quickness of dissipation of the intense but confined heat into the cold metal surrounding the weld, is said to result in a narrow heat-affected zone on either side of the weld.

A third advantage of electron beam welding is very close control over weld penetration. By properly presetting the electronic controls for the electron beam tube, depth of weld penetration can be controlled within 0.001 inch. As yet, no standards have been established for presetting these controls, so proper settings must be established before each welding job is started. This is accomplished by using coupons or test welds which are identical to the work to be done. Once proper control settings are established for the test welds, the results will repeat when production work is started.

The illustrations with this article show the AiResearch electron beam welder in operation. It is installed in the Materials and Process Laboratory where both production work and process development work can be carried on simultaneously. The vacuum chamber on this machine is 24 inches in diameter and 54 inches long and constructed of 3/4inch mild steel plate. Heavy glass observation windows for viewing and controlling the weld in progress are installed. Five pumps are used for chamber evacuation—a large "roughing" pump, a · 16-inch diffusion pump, a smaller diffusion



A 7500 p.s.i. gaseous oxygen supply assembly—typical of the high pressure spheres now being produced on the electron beam

welder. The Hydroformed or forged halves of the sphere, usually fabricated from one of the exotic alloys, are welded together.

# ". . . repeatability is extremely reliable . . ."

pump, a holding pump, and a pump which evacuates the electron tube or "gun" that generates the electron beam.

After the work has been placed in the chamber with its proper fixture, and after the chamber has been closed and sealed, it requires approximately five minutes to create a vacuum equivalent to 10<sup>-4</sup> (0.0004) mm. of mercury. When this near perfect vacuum level is reached, welding is started.

The welding fixtures or positioners used are automated to move the work along the approximate weld bead path. Control of the electron beam itself is limited to about a 3-inch movement in any direction accomplished by an external control. Thus, the automated positioner needs only to approximate the path of the weld, and its construction is not highly critical. To date, such weld fixtures have been designed for both longitudinal and circumferential welding, and for diametrical welding around a configuration in a flat plane.

The tungsten filament from which the electrons are emitted is mounted in a removable filament holder and is easily and quite economically changed when an old filament gives out. Theoretically, and if operated in a perfect vacuum, filament life would be very long indeed. But under shop operating conditions, filament life averages about one week.

Currently, the tube in the AiResearch electron beam welder is operated through a step-up transformer at 20,000 volts and 750 milliamperes, each of course adjustable downward to meet specific requirements. With this voltage, it is possible to weld material, without filler rod, up to  $\frac{1}{4}$  inch thick. Plans are now afoot to increase this potential to 30,000 volts so that material up to  $\frac{1}{2}$  inch can be welded or fused together without the use of filler metal.

Control of the tube and electron beam it produces is accomplished by a control panel which applies the required voltage-current characteristics to the anode and grid of the tube, and to the electromagnetic focusing coil which focuses the electron beam onto the work. Once proper control settings have been established for a definite combination of meterials and penetration requirements, repeatability is extremely reliable.

In process development work with the electron beam welder, it has been discovered that, in addition to welding, the same equipment can be used for certain high precision milling and drilling operations, using the inherent distintegration characteristics of the beam for metal removal. In experimental work, precision holes of from 0.002 to 0.004 inch in diameter have been drilled. and precise milling operations have been performed. Possibilities along these lines will be enhanced when the machine potential is increased to 30,000 volts.

Results obtained to date from both experimental and production work in the AiResearch shop indicate quite conclusively that the electron beam welder is a very useful and sometime irreplaceable tool for obtaining extremely high quality welds in many of the exotic metals, and in many of the more commonly used but difficult-to-weld alloys. These same results emphasize the fact that electron beam welding will become an established process in many types of space-age production.

\* modern machine shop \*

Theory of Metal Cutting. By Paul H. Black. Published by Mc-Graw Hill Book Co., Inc., 330 W. 42nd St., New York 36, New York. 204 pages. Illustrated. Clothing binding, board covers. Price, \$7.50.

This new book is a scientific analysis of the metal-cutting operation. It

collects and interprets the theories and conclusions concerning what happens at and near the point of a cutting tool.

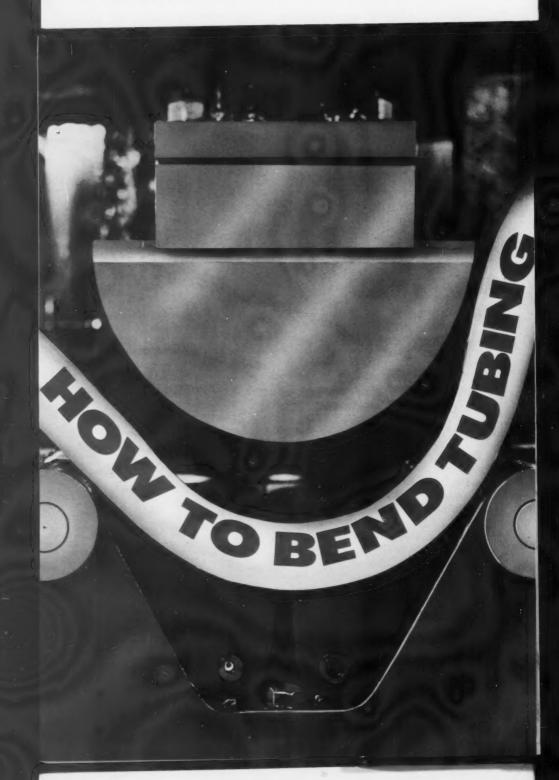
Although the mechanism is complex, a step-by-step consideration of the elements of the process reveals a reasonable and instructive picture which supplies quantitive information shedding considerable light on metal-cutting specifications. The treatment is fundamental and is directed toward presenting an understanding of the process. This should be of direct help in specifying machining operations and schedules to increase production rates of parts made of common materials, and of materials still in development stage.

# 3-D Optical Device Aids Construction of Triplesonic Airplane

Due to the very fine or thin gauge of some structural strain gage wires, a need was found for a close magnification device that would allow the worker to view the strain gage to test specimen application more clearly and yet allow both hands free to perform the operation. The Magni-Focuser, a 3-D binocular magnifier marketed by Edroy Products Co., 480 Lexington Ave., New York 17, N. Y., was chosen. The test specimen shown in the illustration is a portion of a North American Aviation Inc. B-70 honeycomb structural panel. The worker in this instance is wearing a Magni-Focuser to obtain greatly magnified vision in third dimension.



Aircraft worker uses 3-D magnifier to view strain gage used to check test specimen.



# Discussion covers advantages of welded steel tubing and procedures recommended in bending same most efficiently.

By R. M. SPENCER
Chairman, Carbon Technical Committee,
The Welded Steel Tube Institute

Caught in today's difficult economics, industry might well take a new look at bending as a basic fabricating operation, particularly when the use of versatile, electric-resistance welded carbon steel tubing is involved. It might take another look at welded steel tubing which sacrifices no quality for the sake of lowest possible cost.

A prime example of this growing economic awareness is today's attitude to welded steel tubing as reflected by the quality and costs conscious aircraft industry. Thanks to recent advances in bending equipment and the constant research and upgrading of their products by the quality manufacturers of welded steel tubing, it is now possible to achieve bending and fabricating results which only ten years ago would have been thought out of the question.

It is now possible, for example, to bend 4-inch stainless steel tubing of 0.025-inch wall thickness to a center line radius of 6 inches. Wrinkle-free bends can be made in tubes from 1 x 0.010 inch to 8 x 0.020 inch.

A major advantage to the aircraft industry in bending thin-walled tubing (besides uniformity and production speed) is the saving on weight. McDonnell Aircraft recently rewrote into specifications for hydraulic circuits fluid line tubing to include welded tube, thus achieving a 30 percent reduction in cost of tubing, 70 percent reduction in tooling lead time, tool cost and scrap, and a 50 percent reduction in finishing and handling costs without sacrificing 1 percent of quality.

This story is well known to manufacturers of automotive equipment and others who fabricate or use tubing for applications ranging from furniture to precise nuclear research installations. An added advantage of bending is increased tensile strength through work hardening.

There are three basic bending systems which lend themselves to the fabrication of welded steel tubing. One is Draw Bending where the tubing is clamped to a rotating form die and drawn against a pressure die. If necessary, a mandrel may be placed in the tube to minimize risk of wall collapse and a wiper die may be used behind the tangent point of the bend (opposing the pressure die) to eliminate all chances of wrinkling.

Where the workpiece and the form die are both stationary, Compression Bending may be used. Here, a wiper shoe wraps the tube around the form die. This method is particularly useful if there is little clamping area available at the end of the bend or between successive bends. If the end-use of the tubing calls for compound bends with few tangent sections in between, with bends of any angle, length, or plane of rotation, one right after the other, compression bending may be the answer.

A third method of bending is Press Bending which features a form die on the ram moving downward while wing dies pivot to wrap the tubing around the form. Presses used for this type of bending are hydraulically operated and can produce a number of successive, different bend angles by the use of turret-mounted stops to regulate the downward movement of the ram and the resulting bend angle.

With these three bending methods in mind, another broad classification of bending is required. The bending of welded steel tubing falls largely into two general categories:

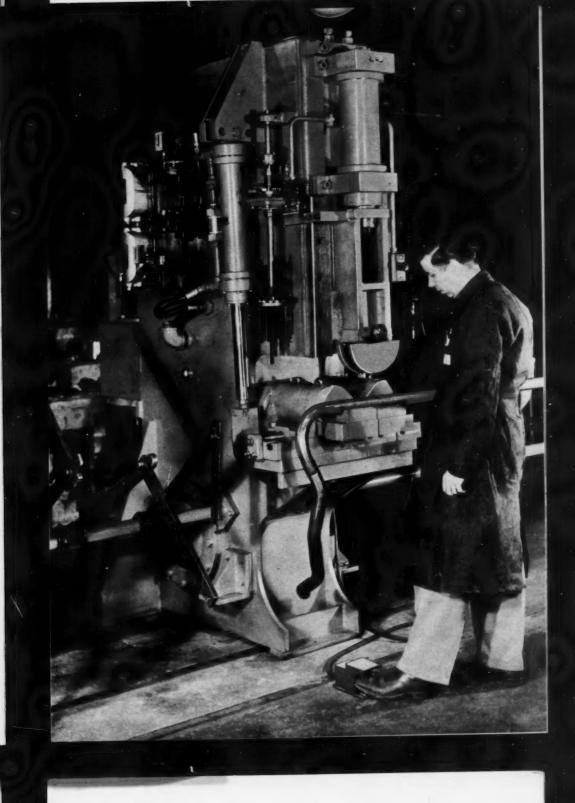
(1) bending without a mandrel and
(2) bending with a mandrel to give internal support.

The tube itself, its final application and its desired shape will dictate whether or not a mandrel should be used in bending, and what sort of mandrel it should be. While it is true that without a mandrel, outer sections of the bend may tend to flatten towards the inside of the bend, economics dictate a judicious study of this helpful fabricator's side.

When the tubing is of relatively thin wall thickness, or when the part is to be bent to a sharp radius, it is likely that a mandrel will be needed. This is to prevent flattening of the thin material. It can also serve as a sizing tool on extremely close tolerance work.

When slight flattening of the part may not be objectionable, as in the case of certain furniture parts or an oil breather pipe for an engine, a bend can be made satisfactorily without a mandrel. Deforming of the tube is not always indicative

. . .



that a mandrel is required for internal support. Sometimes, a setup will be made with wrong pressures on the clamp or pressure die, making the tube collapse merely from insufficient pressure. The contour of the forming die or the other tools can be designed in some cases to counteract some of the stresses developed in the flow of metal in bending. This tends to offset distortion without the use of a mandrel.

Certain shapes will nearly always require a mandrel when other shapes will not. This is true with square tubing compared with similar size and gauge of round tubing. For example round tubing of 2 x 0.083 inch can easily be bent to a 6 or 7-inch center line radius without a mandrel. But, square tubing can hardly be bent on a 30-inch radius without a mandrel. A mandrel is nearly always required for bending square tubing.

It must be kept in mind that when tubing is bent a number of normal things take place. These are: (a) thinning of the outer wall, (b) thickening or wrinkling of the inner wall, (c) possible distortion of the cross section, and (d) some change in the mechanical properties of the steel. The importance of these occurrences is determined by the bending radius, the angle of the bend, the ratio of the tube diameter to all thickness, the bending method itself, and the mechanical properties of the steel.

# **Types of Mandrels**

There are a number of different types of mandrels, each being a practical compromise between tooling cost and job specifications. The simplest mandrel is the plain or plug mandrel. This is a solid rod with an end radius which is inserted inside the workpiece up to or slightly beyond the tangent point of the bend.

For bending, the workpiece is drawn off the mandrel and around the form. As the metal leaves the mandrel, there is no further internal support. But, this mandrel does offer support at the beginning point where the material actually bends and is most likely to wrinkle. Plug mandrels are applicable to general use with moderate wall thickness and fairly large radii bends.

The form mandrel is shaped on the end to fit the form of the bend well beyond the tangent point to offer still more internal support. This mandrel would be chosen over the plug mandrel to make somewhat sharper radii and with slightly thinner wall materials.

Progressing to more complex types of mandrels, the next would be ball type mandrels. The single ball mandrel is similar to the plug mandrel, but with an attached ball at the tip working in a flexible socket. Since the ball swings on the top of the solid body, it can be pushed inside the workpiece beyond the tangent point and can swing into the full radius as the workpiece goes into the bend. The round ball offers full support to the tube I.D. and not only handles thinner wall material on a shorter radius, but it also has a sizing action.

The multiple ball mandrel is

similar but with more balls to extend further around the bend. The more likely the material is to collapse, the greater number of balls required. Some jobs are so delicate that as many as ten balls are necessary to support the part throughout the total bend length.

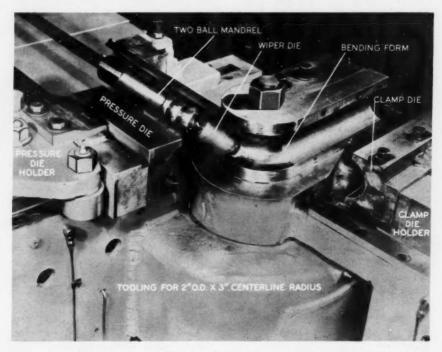
There are variations to the ball type mandrel. A commonly used variety is made up of a series of interlocking ball-like shells connected with links and pins. These permit the balls to swing only in the plane of rotation of the bend; they can be grooved to accommodate weld flash inside the tube. This type mandrel is used for bending radii of one tube diameter or greater, and

must be aligned perfectly to avoid breaking the linkage.

Another variation is the cable and ball mandrel. This carries balls nested closely together to give increased internal support to the workpiece. The balls are held together with a pretensioned cable. Although not as strong as the link type, this construction allows the balls to rotate. It is applicable to bend radii of less than one tube diameter and to compound bends which require a mandrel to flex in two directions.

## **Mandrels for Compound Bends**

A compound bend is one in which tangent points of adjacent bends



Close-up view showing various components of mandrel type bender for welded steel tubing.

are too close to allow straight clamping between bends. A compound clamping die must be used to hold the workpiece. If the bend requires deep mandrel support the cable mandrel can snake into the previous bend and flex with the bend in progress.

Another interesting mandrel is the laminated shim type for some rectangular shapes and extrusions. This is built up of thin spring steel laminations which will flex with the bend while filling out the square or rectangular internal area of the workpiece.

The mandrel used for more complex shapes, with open areas too small to receive a metal mandrel, is the nylon mandrel. Some of the most complicated extrusions are bent after inserting a special strip of nylon in a groove from which it can be extracted by hand after the workpiece is bent.

All mandrels perform the function of filling the open cross section areas, internally supporting the workpiece walls. While the intricate mandrels are taken for granted on tough production problems, many people overlook the versatility of the simple form and plug mandrels. These solid mandrels are often more useful because they do not have to be a perfect fit for a given size of tube.

Commercial tubing will vary in tolerances from different sources. A given mandrel may be quite undersize for some while fitting perfectly in other workpieces. In this case, the operator can adjust the undersize mandrel to extend a little deeper into the bend, beyond the tagent point, and the smaller mandrel may offer full support right where it is needed most.

Electric resistance welded carbon steel tubing is available in a multitude of shapes and sections and readily lends itself to bending and other fabricating operations. Round tubing can be easily bent in any direction to form a full strength bend. Bends can be produced with or without mandrel support. During bending the outer wall is stretched and the inner wall is compressed. Because of this compressive action there is a tendency for buckles to form at the inside of the bend. Consequently, a mandrel has to be used with light gage tubing to keep the metal smooth.

The minimum radius to which a tube can be bent without a mandrel depends on the size, gauge and ductility of the metal. It is usually determined by:

$$L = \frac{0.2468 \; \pi \; (D^2 - d^2)}{t}$$

where L = Center line radius of bend

D = Outside diameter

d = Inside diameter

t = Wall thickness

Methods for calculating minimum distance between bends and distance of bends from tube ends are the same as mentioned above, except that the distance between bends in different plants can be lowered to  $2\frac{1}{2}$  times the tube O.D.

To prevent high scrap losses and reduce time required for forming, small radius bends should be avoided in light gauge, large diameter tubing. Tube with a heavier wall, smaller O.D. or bends of a larger radius will ease fabrication.

When a mandrel is not used, the minimum distance between bends in the same plane should be at least twice the O.D. of the tube. Minimum distance between bends in different planes should be three times the O.D.

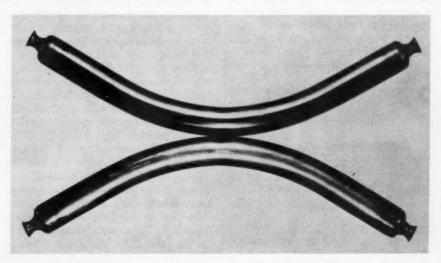
To maintain a true tube diameter at the ends, the distance between the theoretical tangent point of a bend and the end of the tube should be twice the tube O.D.

In any tubing design it is important not to specify a vertical and horizontal bend at the same section. Such a design can be avoided by using an extra bend in another section of the tube. Adjacent bends in the same direction are impractical and should be avoided by specifying one compromise radius.

Some wall displacement occurs in all tubular bends, especially

mandrel bends. The amount of displacement will vary, depending on the equipment used and the analysis and mechanical properties of the tube. In typical tests made with a production run of 1010 steel (resistance welded, 25%-inch O.D. x 0.035inch wall, annealed), a tube with a 90-degree bend was checked in the plane of the bend midway between the bend starting points. The wall of the tube at the inner radius showed an increase in thickness of 20 percent. Wall thickness on the center line radius showed an 8 percent decrease and thickness of the wall at the outer radius decreased 30 percent. Ratio of tube O.D. to bend radius was 3:4.

Because the walls of square and rectangular tubing have a tendency to collapse during bending, tubing of this type is generally bent on mandrels. Split dies are employed almost exclusively to facilitate placement and removal of tubing.



Example of bend produced in welded steel tubing using mandrel type bending equipment.

A method for holding a depth of counterbore in relationship to a face with a dimensional float is discussed.

By C. B. WEIDNER

to a Floating Face

The problem of holding a depth of a counterbore in relationship to a face with a dimensional float is encountered quite frequently. I have had occasion to observe several such situations in various shops. The area in which it presents the greatest problem is in the automated multi-station setup. There are all sorts of steps taken to eliminate this type of part because very few shops have solved the mechanics of handling it.

The workpiece shown in Fig. 1 is a typical example of a part with a dimensional float on the overall

length. This float does not allow for the maintenance of dimensions "A," "B" or "C" within their specified tolerance without special tooling. This part is used only to illustrate the type of work and is not an actual workpiece.

We will assume that the workpiece is made of steel and is transported from station to station on a straight line type transport. The basic design of such equipment requires a bushing plate for tool support at each station. These bushings are in a plate which is retracted during the transfer cycle and is moved against the workpiece before the tools advance. Note: This is not a mandatory procedure; it is only used for purposes of explanation. The adjusting rod is attached to the bushing and advances or retracts with it.

Figure 2 shows the modification required to the basic drill unit. A way block with a fitted slide is mounted on the forward part of the housing. This switch takes the place of the feed limit supplied with the drill unit. The longitudinal center line of the ways must be parallel to

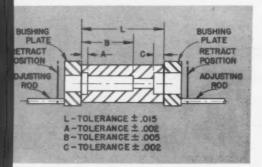


Fig. 1—A typical example of a part with a dimensional float on the overall length.

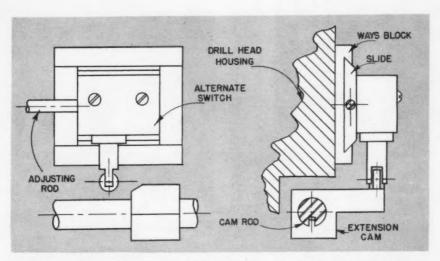


Fig. 2—A sketch showing the modification which was required to the basic drill unit.

the longitudinal axis of the cam rod. The cam rod is that one on which the cam actuates the feed limit switch. A micro switch is mounted on the slide in the manner shown. A new cam may be made or a simple extension may be attached to the existing cam. The adjusting rod from the bushing plate is attached to the slide on which the alternate switch is mounted. The alternate switch is wired into the control circuit in place of the regular feed limit switch.

There is no difference in the use of the drill head with the changes. The big difference comes in from the self-adjusting action. The bushing plate, in advancing to contact the workpiece face, automatically adjusts the feed limit switch to compensate for variations in workpiece length.

There are many ways to apply this type of control to allow for maintaining a set dimension in its relationship to a floating face. I have had occasion to make this application to quite a few different types of jobs. It has never failed to perform in a proper fashion.



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September, 1961

MODERN MACHINE SHOP

141



View showing plug-in bus duct line between two oppositely facing rows of movable muchines emphasizes the non-abstracted housekeeping possibilities provided by this line.

Power supply arrangement simplifies problem of continual rearrangement of machines for straightline production of short-run parts.

Munoger, Plant Leginsering, Guidance Technology, Inc.
Sente Manico, Colifornia

At Guidance Technology Inc., Santa Monica, California, a 3-foot high 440-volt three-phase bus duct running the length of the shop floor between each two oppositely facing rows of machines has greatly simplified the problem of continual rearrangement of the machines for straight line production of the many short-run, high precision components being produced. It has been proved to the satisfaction of all concerned that rearrangement of the relatively small machines into short and unified production lines is much simpler than the awkward and often torturous in-shop handling that results when all machines are left permanently mounted in one place.

Today, on these short production runs, the machines are merely moved into place, in the order of their use, so that the work can pass from one to another in steady progression until it is finished. Only a few of the larger machines are left permanently mounted in one place.

At the time the "plug in" bus ducts were planned, all machines were permanently wired through rigid conduit from overhead gutter installations. Movement of any machine required a time-consuming conduit plumbing job. Compressed air lines and 120-240 volt single-phase power outlets for the machines were contained in separate systems, adding to the conglomeration of line and conduit connections.

It was decided from the first to leave the overhead gutter installation intact and use it as a power source for the plug in bus lines. A single conduit leading down to each plug-in line serves this purpose.

As shown in the accompanying illustrations, the plug-in bus duct is



#### Plug-In Bus Duct Increases Shop Versatility . . .



Here, at an end of one plug-in bus duct line are (upper left) a box which supplies power to the plug-in bus duct from the overhead gutter installation; (left) a transformer which supplies auxiliary 120-240 volt single-phase current through conduit on the plug-in bus duct line; (upper right) a plug-in box from a machine; and (center) a relay designed for use with a 120-240 volt single-phase line.

mounted on three-foot high welded stantions lagged to the concrete floor with 5%-inch lag screws. The duct is provided with plug-in knock-outs every 12 inches. The fused box that plugs into the duct is permanently attached to the machine by means of flexible conduit. Thus, it is only necessary to move the machine into place and then plug in its box to obtain the necessary 440-volt three-phase power supply. Each

bus is capable of supplying up to 100 amperes of current.

To further simplify machine movement and installation, a 120-240 volt single phase power supply with outlets every five feet was mounted in conduit on the same uprights. A step-down transformer, drawing power from the plug-in bus, is used on each plug-in line for obtaining this power supply. Finally, the compressed air lines were strung along these same stantions, with convenient outlets for each machine.

In addition to greatly simplifying continual machine rearrangements, this new power supply arrangement contributes substantially to good shop housekeeping. The absence of numerous permanent connections protruding from the base of each machine makes cleaning around the machines far easier, and proper spacing of the machines from the plug-in bus duct permits easy cleaning between the facing rows.

\* modern machine shop

Modern Production Management. By Elwood S. Buffa. Published by John Wiley & Sons, Inc., 440 Park Ave., South, New York 16, N. Y. 636 pages. Cloth binding, board covers. Price, \$10.25.

Professor Buffa's object in this book is to integrate much of the new analytical methods and material from operations research, management science and industrial engineering with the traditional methods that have long been familiar. New techniques are assimilated into the context of old base points, so that the book reflects the "new look" in quantitative methods and combines them with "hard core" production concepts. The presentation offers a balance between the old and the new. "Modern Production Manage-

ment" deals with the methods of analysis, and the design and operation of production systems. The author's broad definition of production —the process by which goods and services are created—includes factories, offices, and other types of firms.

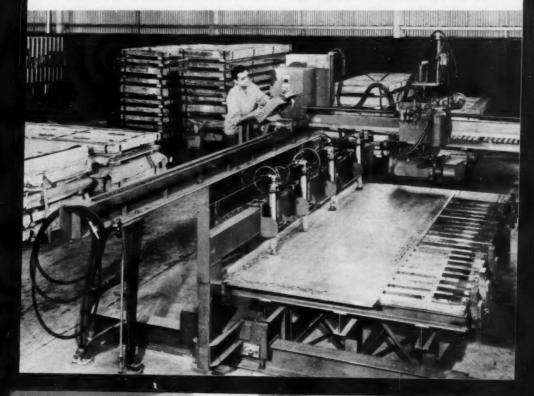
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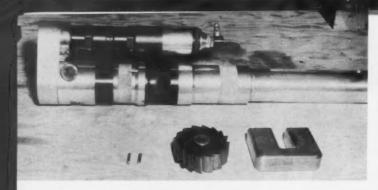
#### Aluminum Plate Cutting Machine

New equipment for saw cutting aluminum plate has been placed in operation at the Los Angeles plant of Joseph T. Ryerson & Son, Inc. Called a Ty-Sa-Man saw, after the name of the manufacturer, Ty-Sa-Man Machine Co., Inc., 1101 White Ave., Knoxville,

Tenn., the machine has a capacity for cutting aluminum plate up to 4 inches thick, in sizes up to 6 feet wide by 12 feet long. The cut edges of aluminum plate sawed with the Ty-Sa-Man machine are said to be very smooth and clean. The machine also permits aluminum plate to be cut to exact squareness, with opposite edges parallel. Cutting tolerance is plus or minus 1/32 inch.

Aluminum plate cutting saw now in use at Los Angeles plant of Joseph T. Ryerson & Son.





Portable milling cutter used for redimensioning the landing gear lugs. Note the three reduction gear boxes (on shorter portion of tool) mounted between air motor and transmission drive. Fixture at lower right is used to hold the tool in the lug holes.

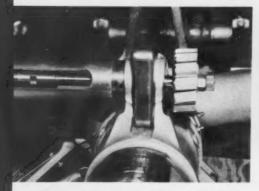
## Portable Milling Tools Solve Lug Machining Problem

By GILBERT C. CLOSE

Sometimes just getting a job to the machine constitutes the major time-consuming effort involved in a machining operation. This situation threatened recently at the Long Beach, California Division of Douglas Aircraft Company when it became necessary to re-dimension and slot the 240,000 p.s.i. steel lugs on landing gear struts which were already installed on the airplane.

The obvious solution was to dismount the struts from the airplane for the milling operation. The disassembly and reassembly work involved would have been costly indeed. So Douglas tooling engineers solved the problem by taking the machine to the work.

A Quackenbush router air motor was used to power small, portable milling tools (see illustrations),



This illustration shows the portable milling cutter mounted on the landing gear lug.



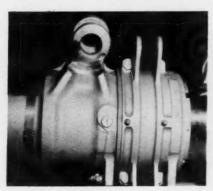
Note the elliptical bushing in the lug hole which is used to feed cutter into work.

which in turn were fixtured for mounting on the workpiece itself. The already accurately drilled holes in the lug were used as a precision take-off point for the setup. Miniature reduction gear boxes were mounted in sequence to reduce air motor speed to proper cutter speeds.

In the milling operation, three reduction gear boxes are used to reduce cutter speed to approximately 9 r.p.m.; two reduction gear boxes are used for driving the slot cutter at a somewhat faster speed.

Elliptical bushings in the lug holes are used for feeding the cutter into the work. For slotting, the feed is controlled along an integral slide by a knurled thumbscrew.

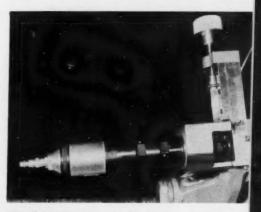
Though few who read this will be faced with the problem of re-dimensioning an already installed lug, the idea involved has numerous applications. Whenever it is extremely difficult to get work to a machine, or when it is extremely difficult to make a specific machine setup, the idea of using a small and specialized tool indexed to the workpiece itself certainly merits full consideration.



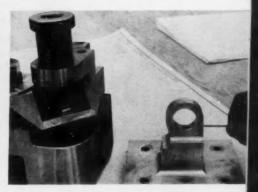
The finished job. Purpose was to extend flat surface on exterior face of lug.



The portable slot cutter. Note the two reduction type gear boxes that are mounted between the air motor and the milling cutter.



This illustration shows the slot cutter mounted in place for use. Screw-controlled integral slide feeds the cutter into the workpiece.



Here a sample lug has been slotted to "prove" the slotting tool for production work.



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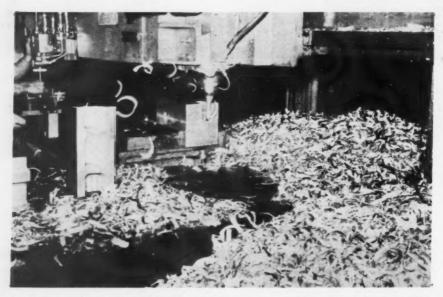
## MORE **PRODUCTION**



#### **Production Milling Aluminum Blocks**

Over eight tons of aluminum chips were milled from a total of 1500 aluminum blocks with only one Weldon Ski-Kut end mill, ac-

cording to The Weldon Tool Company, 3000 Woodhill Rd., Cleveland 4, Ohio. This remarkable example of production milling was recently made by a Cleveland jobbing shop faced with the task of milling three cavities each 4 x 3 x 31/8 inches into



Production milling with Weldon Ski-Kut end mill, removing 12 pounds of aluminum chips from a 6 x 14 x 7 inches aluminum block in a period of approximately 8 minutes.

### THROUGH

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each of 1500 aluminum blocks 6 x 14 x 7 inches in size. The single Weldon Ski-Kut end mill that did this job with only two resharpenings had a 11/4-inch diameter of cut, 4inch length of flutes, 11/4-inch shank diameter and a ball end.

Operating at 960 r.p.m. (314 s.f.m.) and at an average feed of 8 inches per minute, 50 blocks were completely finished in a single eight-hour shift. The machine used was a converted planer with a tracer attachment. Approximately twelve pounds of aluminum chips were milled from each block, resulting in 600 pounds of aluminum chips each eight-hour shift.

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modern machine shop

#### Roller-Burnishing **Machine Contributes** to Automotive Safety

On automotive components where safety is critical, Ford Motor Company takes every possible manufacturing precaution to protect against possible failures in service. In the case of front-wheel spindles. Ford has found that roller burnishing the radius where the splindle shaft projects from the

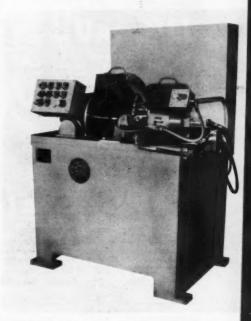


Fig. 1-Roto-Flo Model 1026 Roller Burnisher strengthens automobile front-wheel spindles by coldworking the critical fillet.

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#### more production . . .

spindle assembly strengthens that area and lessens the chance for fatigue cracks to develop.

Working with Ford engineers, Michigan Tool Co., 7171 E. Mc-Nichols Rd., Detroit 12, Mich., designed and built a special machine to perform this operation efficiently and economically. Designated the Roto-Flo Model 1026 Roller Burnisher, Fig. 1, the machine makes use of two rollers under hydraulic pressure to burnish the fillet. The wheel-spindle assembles are made of 5132 steel and are ground before burnishing the fillet radius.

In operation, a spindle assembly is placed in the machine and the operator presses the cycle button. The machine spindle rotates and the two tool slides move in hydraulically until the rollers contact the



Fig. 2—In operation, two burnishing rollers, 90 degrees opposed, move in and are held, under constant hydraulic pressure, for preset duration of time while the workpiece rotates.

radius, as shown in Fig. 2. The rollers are mounted in the toolholders so that they are free to move axially and therefore center themselves in the radius. The rollers, under 60-p.s.i. hydraulic line pressure, coldwork the fillet for 15 to 17 seconds; retract, and the machine stops. This complete cycle is fully automatic and is said to require only loading and unloading by the operator.

Design of the burnishing rollers causes them to work the fillet surface evenly and prevent tool marks. This is accomplished by using two different cross-sectional radii on the circumference of the rollers. As the rollers contact the rotating wheel spindle and revolve, they are held under constant hydraulic pressure and the contact line of roller to workpiece moves up and down the fillet because of the use of two different radii for the roller edges. The roller's radii are blended smoothly into each other by stoning

the meeting edges and the rolling surfaces are accurately polished to a 5 microinch finish.

Production rate of the Model 1026 Roller Burnisher is 102 pieces per hour and tool life is approximately 5,000 pieces. Design of the machine is such that simple retooling can convert it to a different size wheel spindle.

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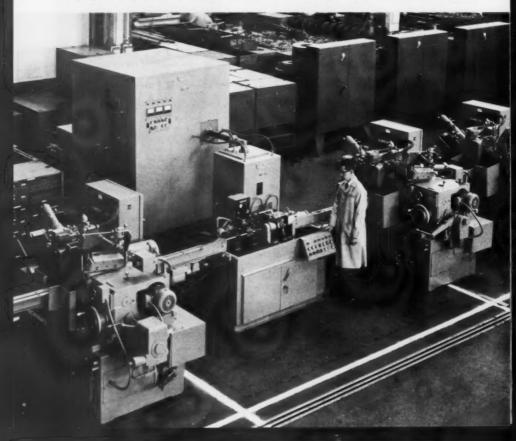
## Continuously Operating Production Line Grinds and Hardens Piston Rods

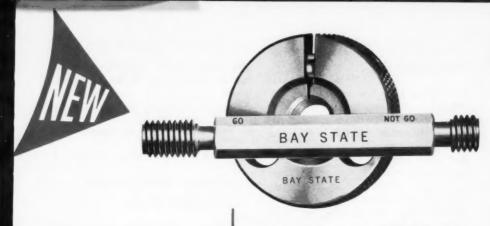
A precision production line, recently built by the Grinding Machine Division of The Cincinnati Milling Machine Co., Cincinnati 9, Ohio, includes an Inductron Induction Heating Machine to automatically harden the parts as they progress from the No. 1 to the No. 2 Centerless Grinder in the line. A

continuous flow of workpieces (shock absorber piston rods) pass through this production line at the rate of 12 feet per minute, or 960 parts per hour.

At the beginning of the line a hopper feeds the parts into the first centerless for primarily grinding, removing about 0.006 inch of stock. The next machine is a 50 KW RF Inductron. At the work station of this machine, an ingenious feeding device continues the forward movement of the parts while simultaneously rotating them. Since the ends of the rods must remain soft, heat

Grinding and selective induction hardening of shock absorber piston rods proceed continuously through this production line built by Cincinnati Milling's Grinding Machine Division.





### BAY STATE

# GAGES

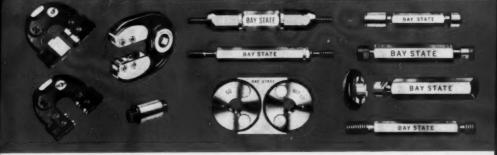
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#### more production . . .

is restricted to the center section. As each rod reaches a predetermined point, a part presence sensing device sends a signal to energize the induction coil through which the rods pass, producing a brief, accurately timed heating cycle for each part. The rods continue through an adjacent quench ring, resulting in a uniform 50 Rc case, 0.020 inch deep.

From the Inductron Induction Heating Machine, parts are automatically conveyed to four in-line Cincinnati No. 2 Centerless Grinding Machines for finish grinding. Stock removed by these four machines is 0.004, 0.002, 0.001 and 0.0005 inch respectively.

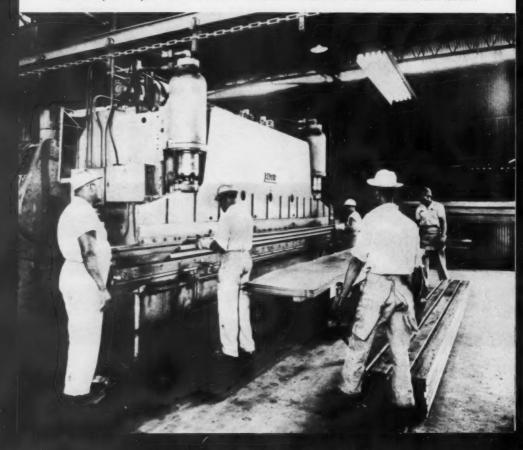
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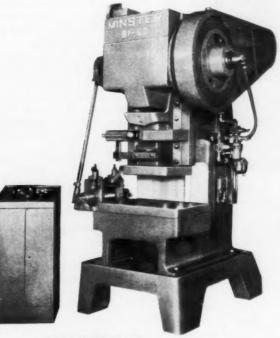
#### Hydraulic Press Brake Forms Roof Deck

Limited production runs of roof deck are handled profitably on a hydraulic press brake at Southwest Steel Products, Houston, Texas.

View of hydraulic press brake installation used to form roof deck at Southwest Steel Products.



If you make small parts in large volume.... this B1 press will make them faster, more accurately and at lower cost per part.



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The Minster Machine Company, Minster Ohio

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Spindle does not rotate between duty cycles but starts cutting rotation softly and slowly as pressure is applied to the feed lever. Further, rotation stops instantly and automatically when pressure on the feed lever is released; and reverses when pressure is reversed.

As a result of this unique feature, blind holes now can be tapped to the very bottom without risk of tap breakage, thin materials can be precision tapped without stripping, brittle materials can be tapped without chipping.

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Some 1600 feet per hour of 20-foot long by 26-inch wide roof decking are formed using press brake dies. The press brake dies can be changed in 45 minutes to form any type of decking. Three changes per week are generally made.

Producing 20 tons of decking in 8 hours, the press brake is more than adequate for Southwest's production requirements of 300 to 900 tons per month. The press brake is a product of Pacific Industrial Manufacturing Co., 848 49th Ave., Oakland. California.

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#### Special Milling Cutter Solves Rough-Milling Problem

To permit operation of a center-column indexing machine at its top production rate, a manufacturer of aluminum automobile parts needed a cutter that could roughmill a 7-inch-long part in less than 10.8 seconds. A special Rigidcut inserted-blade face mill, designed by Wesson Corporation, Ferndale, Mich., permits the operation to be completed in 9 seconds, holds surface flatness under 0.0005 inch maximum indicator reading and produces a surface finish well below 100 microinches, r.m.s. In addition, design of the cutter makes use of centrifugal force to deliver coolant where it is needed.

Cutting speed of this 8.24-inch diameter cutter is 7776 s.f.p.m. with a feed rate of 158 i.p.m. The eight

# HAMILTON Japping SUPER SENSITIVE TAPPING MACHINE



In the field of small hole, precision tapping the HAMILTON Super Sensitive Tapping MACHINE stands alone. It is smooth, silent, precise, and sturdy. Spindle returns to neutral position and stops rotation instantly and automatically when pressure on the feed lever is released.

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#### more production . . .

inserted blades are tipped with Wessonmetal Grade GI carbide. The cutter is mounted on a motorized spindle, rotating at 3600 r.p.m., so that the job can be done at maximum feeds and speeds. The spindle has high rigidity and no "backlash," important because the roughing stock varies from 0.015 to 0.060 inch.

In the special body design, a groove in the back face of the cutter acts as a reservoir and centrifugal force "pumps" the coolant through 1/4-inch radial holes to the blades. The blades are wedge shaped so that centrifugal force tends to drive them tighter into their slots for maximum safety. The cutter operates within a welded shield, however, to confine the coolant so that if a blade did



Standard blades and a modified body on this Wesson Rigidcut milling cutter permit a cutting speed of 7776 s.f.p.m. Coolant is introduced into the groove on the backface, and is expelled by centrifugal force through radial holes leading to each cutter blade.

break in use, no hazard would be incurred.

Success of the standard-blade modified body cutter design can be measured by production figures. Approximately 11,000 parts are produced per grind and, with 17 grinds, about 175,000 parts are made per set of blades. It takes about five minutes to change cutters. Set-up costs are kept down through use of a Wesson micro-adjustable milling-cutter adaptor. With this adaptor, individual blades do not have to be adjusted outward after each grind. Instead, the whole cutter is set forward to maintain the required accuracy.

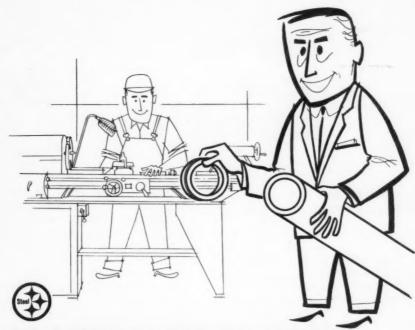
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**Engineered Castings.** By Glenn J. Cook. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 16, N. Y. 240 pages, 6 x 9 inches. Price, \$8.50.

A comprehensive guide for the user and buyer of castings, "Engineered Castings" is a source of broad knowledge for the design engineer as well as a reference book for foundry personnel having duties in marketing, manufacturing, and engineering. The book-in which primary emphasis is given to casting use, rather than casting production-provides the reader with a broad understanding of and appreciation for metal castings as engineering materials.

Among the topics covered are sand molding, shell molding, investment casting, die castings, inspection and testing, vacuum casting, materials, casting designs and tolerance, as well as foundry selection.



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## IDEAS FROM READERS



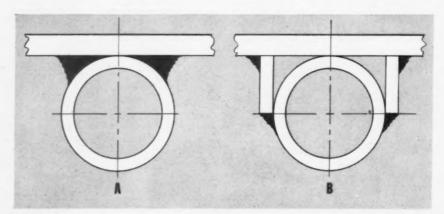
#### **Improved Design Reduces Welding Costs**

By ROGER ISETTS

Very often in the design of larger machinery and fixtures, it becomes necessary to weld a round boss to a flat plate. If the boss is welded as shown at A in the accompanying sketch, an enormous amount of weld must be laid in order to obtain a good joint. Welding time is therefore greatly increased, especially if the boss is longer. Moreover, the larger the boss is in

diameter, the worse the problem becomes. Even staggering the welds will only help slightly. However, the main objection is the warpage and distortion that occur because of the excess heat generated. This makes it especially troublesome if any finish machining is to be done after welding.

Shown at B in the sketch is a method of welding such components that will greatly reduce fabricating time and yet is equally as sound structurally. On each side of the boss small pieces of flat stock are placed and welded on top and bot-



Sketch showing method for reducing welding and machining time in designing larger machinery or fixtures involving the application of a round boss to a flat plate.

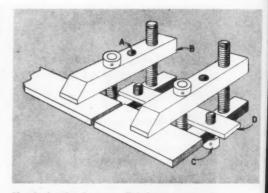
tom. While at first thought it may seem that the cost of such bars would offset any advantage, it is actually a negligible expense compared to the cost of increased welding and machining time.

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#### Tie Bar Increases **Usefulness** of **Parallel Clamps**

By CHARLES H. WILLEY

The accompanying sketch shows how the usefulness of parallel clamps can be increased, particularly for weld or solder work. Holes, A, are drilled and tapped in the clamps. B, to accommodate cap screws, C, which are in turn used to fasten



Sketch showing how parallel clamps are used with a tie bar for a welding operation.

a tie bar, D, (or two tie bars) to the clamps in the manner shown. Thus, the clamps can be used in pairs and readily adjusted to different spacings when clamping workpieces together for either welding or soldering.

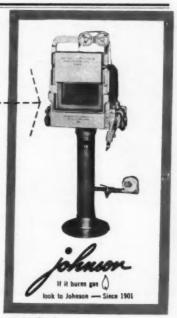
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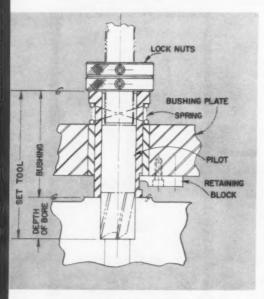
ideas from readers . . .

## Spring Loaded Bushing Controls Depth of Bore

By R. K. DULEK

Experience with a certain job showed that close tolerance depth of bore was difficult to consistently maintain. With the part located from two dowel holes, machined from a previous operation, the milled surface from which the depth of bore was gaged was not consistent in height in the fixture.

Shown on the accompanying sketch is a simple yet very effective method which we devised for controlling depth of bore, without costly tooling. A spring loaded bushing, with enough travel for ease of load-



Simple method for controlling depth of bore.

ing and unloading the part in the fixture, is held in place by a small retaining block and assures correct depth of bore. The tool, guided in the bushing, moves down until the stop collar, having depressed the bushing down the part, gages the depth of cut. With the bushing ground on top and bottom and the cutting tool gaged from cutting face to lock nut, the depth of bore is held regardless of varying height of the part.

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Industry Standard for Cemented Carbide Products. The Cemented Carbide Producers Association announces that a new Simplified Practice Recommendation listing standard stock items of the cemented carbide industry has been issued by the Commodity Standards Division, Office of Technical Services, U. S. Department of Commerce. This publication is entitled "Standard Shapes, Sizes, Grades, and Designations of Cemented Carbide Products." The official government designation is R263-60.

The document covers forty-four items which are most popular in industry such as throw-away carbide inserts, saw tips, chisel blanks, die nibs, masonry drills, and twist drill blanks. Each of the listings for the standard stock items are broken down according to the grade of carbide. A uniform system of identification of products is also described.

Free copies are available by request to the Cemented Carbide Producers Association, 2130 Keith Building, Cleveland 15, Ohio.



It takes less than 15 seconds to pre-set the length of stroke for most efficient operation and maximum safety. The rapid, dual speed work cycle provides fast approach, slow work and fast return—or a stroke as slow as 6 operations per minute. It's easy to "inch" the ram or reverse it at any point in the stroke. Dangerous sheet whipping with resultant costly kinking can be virtually eliminated. This dependable 25 ton hydraulic press brake is available in 6 and 8 foot bed sizes.

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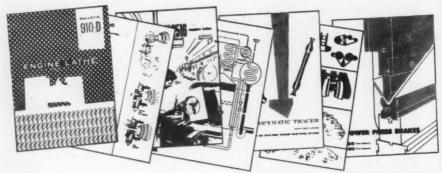


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METALWORKING

EQUIPMENT



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**Drill Jig Bushings** 

Acme Industrial Co., 200 North Laflin, Chicago 7, Ill. Speed selection chart on drill jig bushings instantly determine individual bushing requirements for jobs. Information includes standard number, fraction and letter drill sizes complete with decimal equivalents. Standard drill ranges, outside diameters and lengths are also supplied.

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Type Holders

Acromark Company, 9 Morrell St., Elizabeth, N. J. Folder describes hand and press tools for shops requiring product marking and interchangeability of the marking setup. The instantaneous type change principle as well as methods of producing curved lines and impressions on flat and contoured stock is illustrated. For more data circle 7 on Postpaid Card

Vibrators and Vibratory Pedestal Drivers

Automatic Feeder Co., 4752 West Washington Blvd., Chicago 44, Ill. Brochure contains information on Vibra Pak Electric Vibrators and Vibra Driv Vibratory Pedestal Drivers. Easily understood tables and drawings give complete infor-mation on both Vibra Pak and Vibra Driv, listing model numbers, dimensions, mounting requirements, electrical data and O.E.M. prices.

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#### Indicators

Brush Instruments Div., Clevite Corp., 37th and Perkins, Cleveland 14, Ohio, Folder describes two models of the Surfindicator. Complete specifications and prices are given for both models.
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**Contact Wheels and Rolls** 

The Carborundum Co., Nigara Falls, N. Y. Folder discusses the engineering principles behind the operation of contact rolls. Theory selection, ordering and use of contact wheels are also discussed. For more data circle 10 on Postpaid Card

**Disc Grinders** 

Besly-Welles Corp., 120 Dearborn, South Beloit, Ill. 28-page catalog illustrates and describes Besly-Welles Disc Grind-

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**Adjusting Tools** 

Briney Mfg. Co., P. O. Box 208, Pontiac, Mich. 16-page catalog 61-C, in color, describes and illustrates three types of precision adjusting tools which allow precision adjustments in tenths without loosening or tightening any screws. For more data circle 12 on Postpaid Card

Milling Machine

Brown & Sharpe Mfg. Co., Machine Tool Div., Providence 1, R. I. Bulletin MM 55 presents complete specifications, including illustrations covering construction features and operation of and optional equipment for the Brown & Sharpe Dynamaster No. 2 Universal Milling Machine.

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#### **Power Presses**

Johnson Machine & Press Corp., 620 West Indiana Ave., Elkhart, Ind. Catalog No. 60 lists complete specifications on 50 models of company's line of power presses, including straight side, inclinable, horn and gap.

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# FREE

nd Inside Back Cover for requesting free copies of literature listed below.

**Die Casting Machine** 

Cleveland Automatic Machine Co., 4940 Beech St., Cincinnati 12, Ohio. Bulletin No. 561 illustrates and provides a complete description of the Cleveland 250-Ton High Pressure Hydraulic Die Casting Machine.

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Countersink

Wohlnip Products, Inc., 634 Central Ave., East Orange, N. J. Bulletin No. 202 illustrates and describes the Wohlnip Ball Joint Countersink, with radial float motion for precise depth and concentric countersinking and engineered for hand drills.

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Taps, Dies and Gages

Field Tool Supply Co., 31 South Desplaines St., Chicago 6, Ill. Wall chart lists special sizes of high speed taps, dies, thread plug and ring gages.

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**Electric Infrared Radiant Heat** 

Fostoria Corporation, Dept. 103, 1200 North Main St., Fostoria, Ohio. 4-page, 2-color brochure contains application illustration, both indoors and out, on electric infrared radiant heat. For more data circle 18 on Postpaid Card

**Carbide Tools** 

Atrax Company, 240 Day St., Newington 11, Conn. Brochure is a guide for selecting and ordering carbide tools for practically any operation on conventional materials as well as abrasive plastics, fibers, synthetics, laminates and exotic materials and alloys. For more data circle 19 on Postpaid Card

**Air Valves** 

Hannifin Company, Dept. 166, 501 South Wolf Road, Des Plaines, Ill. Bulletin 0611-B1 describes three Hannifin Air valve models. A companion line of bottom and side ported bases is also described.

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**Die Polishing Machine** 

Parker-Hartford Corp., 650 Franklin Ave., Hartford 1, Conn. Brochure, in color, describes Hartford's Die Polishing Machine. Specifications are also listed.

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**Drill Head** 

Bellows-Valvair, MMS-861, Akron 9, Ohio. Bulletin BL-22 gives all needed data on Bellows-Locke Model 22-A Drill Units.

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**Wrenches and Tools** 

Snap-On Tools Corp., 8109 28th Ave., Kenosha, Wis. 128-page catalog illustrates and describes in detail complete line of wrenches and hand tools for production assembly, maintenance work and product service. Tools such as manual and hydraulic gear pullers, electric drills, sanders, grinders and so on, plus electronic and electrical instruments for diagnosing engine operation in fleet maintenance shops are also included.

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**Hydraulic Cylinders** 

Sheffer Corporation, Cincinnati, Ohio. Brochure, in color, lists information on Sheffer's Series HH Hydraulic Cylinders. For more data circle 24 on Postpaid Card

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**Milling Cutters** 

The O. K Tool Co., Inc., 800 Elm St., Milford, N. H. Catalog 13 gives information on the O K line of milling cutters. For more data circle 25 on Postpaid Card

#### Grinders

Springfield Machine Tool Co., Springfield, Ohio. Bulletin 197-F describes Springfields Vertical Universal Grinders. For more data circle 26 on Postpaid Card **Drill Sets** 

Precision Twist Drill & Machine Co., 13 Woodstock St., Crystal Lake, Ill. Fourpage bulletin illustrates and describes the complete line of Precision Drill Sets and Stands for tool and die makers, machinists and industrial users. Number, letter and fractional size drills are listed in related and combination sets from ½ inch down to No. 80.

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**Air and Hydraulic Cylinders** 

Miller Fluid Power Div., Flick-Reedy Corp., 7N015 York Rd., Bensenville, Ill.

32-page bulletin AJH-104S describes Miller complete line of air and hydraulic cylinders and provides all information needed to select cylinders by size, thrust, bore, stroke, mounting and so on. Other useful information includes piston, piston rod, and tie-rod torque tables; charts on column strength, rod deflections, acceleration, factors of safety, pressure losses in pipes, cylinder forces; and other valuable data.

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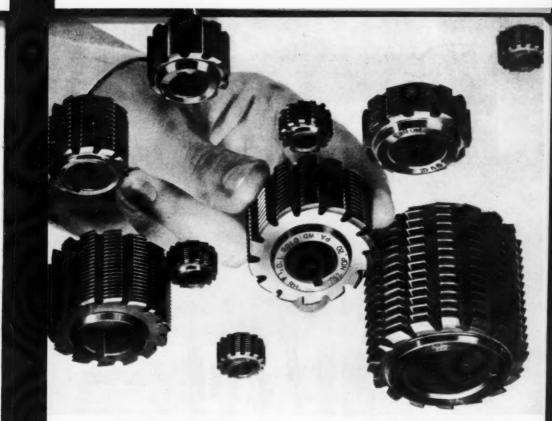
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DANLY MACHINE SPECIALTIES, INC. 2100 South Laramie Ave., Chicago 50, Illinois For more data circle 420 on Postpaid Card **Cutting Fluid** 

Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati 9, Ohio. Brochure entitled "New Five-Star Cimcool" (PC-375) describes a chemical emulsion. water base, cutting fluid, which is said to give trouble free performance. The cutting fluid has effective rancidity and rust control. For more data circle

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**Thread Grinding Machine** 

Jones & Lamson Machine Co., Springfield, Vt. 6-page folder describes in full the Model 410 Semi-Automatic Thread

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Clamps

Wespo Div., Vlier Engineering Corp., 26935 West Seven Mile Rd., Detroit 19, Mich. 16-page catalog lists more than 80 different models and sizes of clamps.
For more data circle 31 on Postpaid Card **Power Press Equipment** 

Cooper Weymouth, Inc., 600 Honeyspot Rd., Stratford, Conn. Catalog No. 61 has details and specifications on a complete line of air and mechanical operated slide feeds, automatic roll feeds, stock reels, straightening equipment and scrap choppers.

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**Materials Handling Equipment** 

Syntron Company, 309 Lexington Ave., Homer City, Pa. Catalog No. 616 contains illustrations and presents descriptions, data and specifications on vibratory materials handling equipment,
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ment, mechanical shaft seals, paper joggers, portable power tools and power rectification equipment.

For more data circle 33 on Postpaid Card

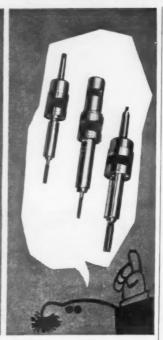
Nebel Machine Tool Corp., Lathe Div., 3409 Central Parkway, Cincinnati 25, Ohio. Bulletin No. 222 gives the complete and illustrated story on the Nebel Micro-Turn High Speed Precision Lathe with continuously variable range of spindle speeds.

For more data circle 34 on Postpaid Card

#### Centers and Spindles

Nielsen, Inc., Lawton, Mich. 8-page catalog illustrates complete line of Nielsen's ball bearing lathe centers and tailstock spindles. Complete information on sizes, capacities, weight of work tapers pieces. available, as well as complete information for ordering, is provided in the catalog.

For more data circle 35 on Postpaid Card

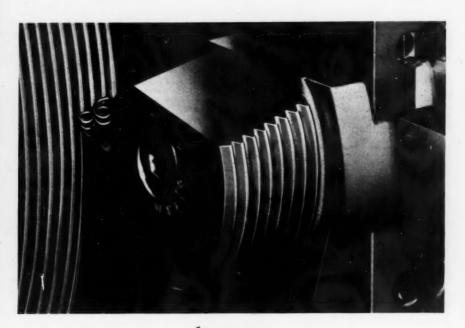


Scully-Jones "Safe-Torque" drivers release smoothly, instantly, and completely below the break strength of the tap. Let you tap at high speeds to full depth. There's no heat-producing friction or impacting. Preset torque remains constant without readjustment. Increase production . . . reduce scrap . . . upgrade quality. Three types, described in Bulletin No. 20-50. Write for your copy, today.



Scully-Jones and Company 1909 South Rockwell Street, Chicago 8, Illinois

For more data circle 422 on Postpaid Card



# ... because it's the only single point threading tool with multiple cutting surfaces...

... a great many people say the same things about short run threading with our NAMCO Single Chaser Vers-O-Tool. Anthony Janik, Tool Room Superintendent at Ridge Tool Company, Elyria, Ohio, says this: "With this Single Chaser Vers-O-Tool, we thread in about half the time required by other single point threading tools, can cut threads of almost any diameter and never fail to meet tolerances. What's more, we can set it up quickly and easily on any turret lathe or machine equipped

with a lead screw attachment". There's a new 44 page bulletin that has complete details on our Single Chaser Vers-O-Tool in addition to the complete line of NAMCO Threading Tools. Write for it now. We'll be happy to send you a copy.



For more data circle 423 on Postpaid Card

#### free literature . . .

#### **Cutter and Tool Grinder**

Covel Mfg. Co., P. O. Box 116, Benton Harbor, Mich. Bulletin 121B describes in detail the Model 12B Electrolytic Cutter and Tool Grinder.

For more data circle 36 on Postpaid Card

#### Punch and Die Maker and Die Filer

Rice Pump & Machine Co., 226 Park Ave., Belgium, Wis. Bulletin No. DF 1-26 illustrates and describes Model PDF Die Filer and Model PDM Punch and Die Maker.

For more data circle 37 on Postpaid Card

#### **Optical Checking System**

Michigan Tool Co., 7171 East McNichols Rd., Detroit 12, Mich. Technical data sheet No. 1124-61 describes Sine-Line Model 1124 Involute Checker.

For more data circle 38 on Postpaid Card

#### **Hydraulic Cylinders**

Mo-Bar Hydraulics Co., Crystal Lake, Ill. Bulletin No. 204 describes in detail Series 'h' Hydraulic Cylinders. For more data circle 39 on Postpaid Card **Press-Staking Machine** 

Cramer Controls Corp., Machine Tool Div., Centerbrook, Conn. Bulletin CAS-2, in color, describes the double-acting Presstaker Model 010B-CA, which is a combination press and stake.

For more data circle 40 on Postpaid Card

#### **Wire Brushes**

Osborn Mfg. Co., Dept. B-34, Cleveland 14, Ohio. 4-page brochure No. 334 gives detailed specifications for disc-center (knot type) wire brushes, cup and keb wire brushes and steel wire scratch brushes.

For more data circle 41 on Postpaid Card

#### **Diamond Wheels**

United States Diamond Wheel Co., 835 Illinois Ave., Aurora, Ill. Brochure contains information on U. S. Pressurelok Turbogrind Diamond Wheels.

For more data circle 42 on Postpaid Card

#### **Die Try-Out Presses**

Dake Corporation, 612 Robbins Rd., Grand Haven, Mich. Bulletin 330, in color, describes in full Dake Hydraulic Die Try-Out Presses. For more data circle 43 on Postpaid Card

BUTTERFIELD DRILLS

BUTTERFIELD DRILLS

100%
INSPECTED TOOLS

DRILLS

FROM THE COMPLETE LINE

#### Socket Head Cap Screws

Standard Pressed Steel Co., Box 556, Jenkintown, Pa. Technical Bulletin, Form 2734, contains information on high-strength stainless steel socket head cap screws.

For more data circle 44 on Postpaid Card

#### **Second Operation Machine**

Standard Tool & Mfg. Co., 734 Schuyler Ave., Lyndhurst, N. J. Bulletin No. 61, in color, describes and illustrates Standard's MSO Second Operation Machine. Specifications are also listed.

For more data circle 45 on Postpaid Card

#### Alloy

Vascoloy-Ramet Corp., 886 Market St., Waukegan, Ill. Booklet No. 6102 covers the applications for V-R Tantung, a cast alloy for various cutting tool and wear applications.

For more data circle 46 on Postpaid Card

#### **Turret Lathes**

Gisholt Machine Co., Madison 10, Wis. Brochure, in color, illustrates and describes the automatic ram type turret lathe. Specifications are also included. For more data circle 47 on Postpaid Card

#### **Power Tools and Accessories**

Rockwell Mfg. Co., Delta Power Tool Div., 491 North Lexington Ave., Pittsburgh 8, Pa. Catalog AB-61 describes the complete line of Delta power tools and accessories. Specifications, catalog listings and descriptions of the various tools are included.

For more data circle 48 on Postpaid Card

#### **Turning Machine**

Taber Instrument Corp., 111 Goundry St., North Tonawanda, N. Y. Bulletin, specification sheet and price list contains information on Taber Model 902-1 "Trace-O-Matic" Centerless Shaft Turning Machine. Optional equipment and supplies are also listed.

For more data circle 49 on Postpaid Card

#### Arc Welders

Lincoln Electric Co., Cleveland 17, Ohio. Bulletin No. 5300.I describes vaporshielded arc welding and the semi-automatic "Innershield Squirt" and full automatic "Innershield" welders. Typical process applications are illustrated. Construction details and mechanical features of the welding equipment are also listed.

For more data circle 50 on Postpaid Card

# BUTTERFIELD BUTTERFIELD

The outstanding performance and tool life of Butterfield drills are engineered into the complete Butterfield line — for best results when any cutting tool is used alone, and for smooth teamwork in multiple tool machining. Whatever you machine, wherever you're located, get these advantages, backed by fast deliveries and expert technical aid . . . Call your Butterfield Distributor. Warehouses in Chicago, Detroit, Fort Worth, Los Angeles, New York and San Francisco.

# BUTTERFIELD BUTTERFIELD

Division, Union Twist Drill Company, Derby Line, Vt.

For more data circle 424 on Postpaid Card

#### free literature . . .

#### **Surface Grinder**

Landis Tool Co., Waynesboro, Pa. 8page catalog 618M-61, in color, describes and illustrates Landis 6 Inch by 18 Inch Precision Hand Feed Surface Grinder. For more data circle 51 on Postpaid Card

#### Chucks

Erickson Tool Co., 34358 Solon Rd., Solon, Ohio. 6-page 2-color catalog describes line of air-operated diaphragm chucks for high-speed internal and external chucking.

For more data circle 52 on Postpaid Card

#### **Optic Goniometer**

W. Von Arnauld Co., P. O. Box 92, Pompton Lakes, N. J. Brochure lists information on an optic goniometer which serves in measuring all forthcoming tool-cutting edges.

For more data circle 53 on Postpaid Card

#### Mandrels and Stones

Superior Hone Corp., 1009 Tennessee Rd., Erwin, Tenn. Literature on standard mandels and stones with a range of 3/32 inch to ½ inch designated as the "A-1" Series.

For more data circle 54 on Postpaid Card

#### Trace

Mimik Tracers, Inc., 3901 Union Rd., Buffalo, N. Y. 10-page folder, in color, describes Mimik 9000 Series Tracer for engine and turret lathes, planers and shapers, Mimik 3000 Series for vertical turret lathes and turning machines and 4000 Series for milling machines. The Templator template making device is also described.

For more data circle 55 on Postpaid Card

#### **Second Operation Machine**

Hardinge Brothers, Inc., Elmira, N. Y. Bulletin DSM 59 gives details on Hardinge High Speed Super-Precision Second Operation Machine.

For more data circle 56 on Postpaid Card

#### Lathes

Farrel-Birmingham Co., Inc., Consolidated Machine Tool Div., 565 Blossom Rd., Rochester 10, N. Y. 8-page bulletin 1218, in color, describes the features and construction of the Farrel-Betts Heavy-Duty 3-Way Bed Lathes which range in capacities from 32 to 92 inch swing. Specifications are also included.

For more data circle 57 on Postpaid Card

#### **Gaging System**

Wales Strippit, Inc., 207 South Buell Rd., Akron, N. Y. Brochure describes and illustrates the Strippit Quick-Change Holder with micro-set gaging system for Sheet Metal Fabricator Models 15A, 10AA and 10A.

For more data circle 58 on Postpaid Card

#### Stainless Steel

Wall Colmonoy Corp., 19345 John R. St., Detroit 3, Mich. Technical data sheet No. T-4 includes separate discussions of procedure for A.I.S.I. Types 403, 410, 416 and 420 stainless steel and A.I.S.I. Types 440A, 440B and 440C stainless steel.

For more data circle 59 on Postpaid Card

#### **Threading Tool**

National Acme Co., 183 East 131st St., Cleveland 8, Ohio. Brochure, in color, describes and illustrates Namco Single Chaser Vers-O-Tool, which is a single point threading tool. For more data circle 60 on Postpaid Card

ror more data circle do un rostparo can

#### Miniature End Mills and Router Bits

Woodson Tool Co., 4811 Lennox Blvd., Inglewood, Calif. 24-page catalog gives prices, descriptions and proper operating speeds for miniature high speed steel end mills and router bits.

For more data circle 61 on Postpaid Card

#### Boring, Drilling and Milling Machine

Sibley Machine & Foundry Corp., 206 East Tutt St., South Bend, Ind. Bulletin illustrates and describes Lucas 3 Inch Bar Precision Boring, Drilling and Milling Machine with tape control. Specifications are also listed.

For more data circle 62 on Postpaid Card

#### Presses

South Bend Lathe, Inc., 423 East Madison St., South Bend 22, Ind. 8-page catalog No. 6106, in color, lists South Bend's complete line of presses. Specifications on all air powered Hydrolair and hydraulic presses, hot plates and accessories are listed in separate sections in detail for easy reference.

For more data circle 63 on Postpaid Card

#### 7-Inch Grinder

Walker-Turner Div., Rockwell Mfg. Co., Dept. 1018, 400 N. Lexington Ave., Pittsburgh 8, Pa. Two-color bulletin illustrates and describes the improved 7-inch grinder. Specification data and catalog listings are also included.

For more data circle 64 on Postpaid Card

# CHOOSE THE FILES THAT HAVE PASSED THE TOUGHEST TEST OF ALL THE TEST OF TIME

In the 93 years we've been making files, our files have proved their superiority on every kind of job and on every kind of material.

As a result Nicholson and Black Diamond files have a brand preference second to none. This leadership comes from one fact: the best filing result for the least money. This test—the test of time—is the one significant test of file worth.

Each of the thousands of file types we make is the result of thorough and continuing research. The steel, the shape and size, the tooth pattern, the type of tooth—all have been determined by study in the laboratory of the world's largest manufacturer of files. Their



correctness has been proved time and time again by users. Can you think of any more meaningful measure of a file's worth?

Your distributor\* has the right Nicholson or Black Diamond file—and a wealth of information to help you get all the value we put in our files.

\* Industrial Distributors provide the finest goods and services in the shortest possible time. Our products are sold exclusively through them.

Nicholson File Company, Providence 1, R. I.

Files • Rotary Burs • Hacksaw
and Band Saw Blades • Hole Saws
Ground Flat Stock • Industrial Hammers



For more data circle 425 on Postpaid Card

## free literature . . .

### **Electric Lift Trucks**

James Campbell Smith, Inc., Willoughby, Ohio. Bulletin No. 4000 on the Scot Model M-4, with a capacity of 4,000 (24 inch load center) and Bulletin No. 3000 on the Scot Model M-3, with a capacity of 3,000 (24 inch load center) describes and illustrates these electric lift trucks. Specifications are also listed for both trucks.

For more data circle 65 on Postpaid Card

**Surface Grinders** 

Boyar-Schultz Corp., 2000 South 25th Ave., Broadview, Ill. Brochure, in color, illustrates and describes Boyar-Schultz 6 by 18 Surface Grinder in hydraulic and hand feed models. Specifications and accessories are also listed.

For more data circle 66 on Postpaid Card

### Hobs

Illinois Tool Works, Tool & Instrument Div., 2501 North Keeler Ave., Chicago 39, Ill. Catalog No. 1006 lists Illinois Tool line of hobs—440 stock types and sizes

20 degrees and 14½ degrees p.a. topping and non-topping.

For more data circle 67 on Postpaid Card

### Rivets

Chicago Rivet & Machine Co., 963 South 25 Ave., Bellwood, III. Rivet catalog describes 1,388 standard tubular and split rivets, 25 single and multiple motorized automatic rivet setters.

For more data circle 68 on Postpaid Card

## **Drilling Machines**

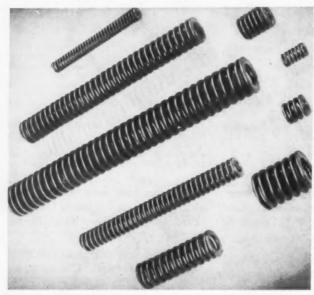
The ElectroMechano Co., 265
East Erie St.,
Milwaukee 2, Wis.
Brochure, in color,
describes Model 111
Automatic Drilling
Machine designed
especially for
small hole drilling
operations.

For more data circle 69 on Postpaid Card

### **Crankshaft Lathes**

Wickes Machine
Tool Div., Wickes
Corp., Saginaw,
Mich. Brochure261 describes and
illustrates Wickes
Crankshaft
Lathes, Specifications of the lathes
are also listed.

For more data circle 70 on Postpaid Card



## **Die Springs**

Chrome vanadium die springs in stock in a wide variety of hole and rod sizes, lengths and deflections. Medium, medium-heavy, heavy duty for increased life and reduced down time. Write for list of specifications and prices, and name of nearest distributor.



## Raymond Manufacturing Division

Associated Spring Corporation

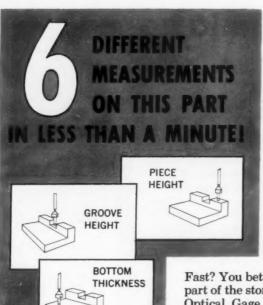
Corry, Pennsylvania

For more data circle 426 on Postpaid Card

5837

176 MODERN MACHINE SHOP

September, 1961



BACK

LENGTH

BAUSCH & LOMB

THICKNESS

WIDTH



Fast? You bet your life . . . but that's only part of the story. Bausch & Lomb DR-25B Optical Gage gives you direct measurement to 0.0001" over a 3" range on a bright, magnified scale . . . to 0.000025" if required. Designed for shop use, no other instrument of this type, at any price, achieves such precision.

Fast, easy, accurate . . . and only \$875! Put the DR-25B to work in your shop and start savings of up to 85% in gaging time (job-proved by Aeroquip Corp., Taber Instrument Corp. and many others).

## BAUSCH & LOMB INCORPORATED 89321 Bausch St., Rochester 2, N. Y.

- ☐ I'd like an on-the-job demonstration of the DR-25B with no obligation.
- ☐ Please send Catalog D-285.

NAME ...... TITLE ..... COMPANY ...

CITY ...... ZONE ..... STATE ......

For more data circle 427 on Postpaid Card

## free literature . . .

**Milling Machines** 

S & S Machinery Co., 140 53rd St., Brooklyn 32, N. Y. 12-page bulletin describes the 1961 Supermill Milling Machines. Information on the 4U and 5U Mills with the latest innovation of electric pendant control, all electric drive, clutches and brakes is also presented in the bulletin.

For more data circle 71 on Postpaid Card

**Combination Drill and Tap Unit** 

Dumore Co., 1302 Seventeenth Street, Racine, Wis. Bulletin DNT-61, in color, describes and illustrates the Dumore Series 28 Drill and Tap Unit. For more data circle 72 on Postpaid Card

Steel-Bonded Carbides

Sintercast Div., Chromalloy Corp., 169 Western Highway, West Nyack, N. Y. Reprint discusses the significant physical and mechanical properties of Ferro-Tic C, a steel-bonded carbide, including

machinability and hardening under heat treatment. Specific applications for the material in tooling and as wear-resistant inserts are listed. For more data circle 73 on Postpaid Card

Tape Control Lathe
American Tool
Works Co., Pearl
St. at Eggleston
Ave., Cincinnati 2,
Ohio. Bulletin
912-A-1, in color,
describes and
illustrates the
American Continuous Path Tape
Controlled Lathe
with the Minuteman Coordinate
Setup System.
Specifications are
also listed.

For more data circle 74 on Postpaid Card

Ratchet Wrenches

Lowell Wrench Co., 97 Temple St., Worcester 4, Mass. Brochure introduces a wide variety of uses for ratchet wrenches as component parts or as functional accessories. Design help is offered for adapting standard wrenches and for making custom wrenches and other ratchet devices for specific applications.

For more data circle 75 on Postpaid Card



## FISKE'S F-456 Fluid Die Compound

A fluid product for spraying in its natural state—less frequent applications permits greater production—keeps dies clean with no build up—improves surface finish—prevents sticking and soldering—minimizes carbon formation—reduces fumes and smoke.



METAL WORKING LUBRICANTS

Since 1870

## FISKE BROTHERS REFINING CO.

129B LOCKWOOD STREET, NEWARK 5, N. J.

Plants: Newark 5, N. J. and Toledo 5, Ohio

For more data circle 428 on Postpaid Card

## IT'S A FACTI

## DRILLHFADS

nomics from the use of a is are chylous, - Drilling one hole at a e cannot be tolerated in this day of automation!

are your best Drillhead buy... 2. This means they last longer
3. This eliminates down time

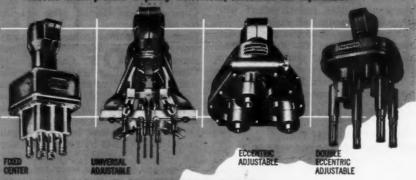
- 1. They are better built and cost no more (Full-ball bearing construction, hardened gears, spindles and driver, and precision grinding!

- 4. This eliminates production losses
- 5. This drastically reduces drilling costs

THOMSON

Drillheads are designed and produced by engineers whose experience in this specific field dates back to

long accumulation of engineering technique and production "know-how" is reflected in our product—a quality tool...solid, substantial and de



DRILL . TAP REAM . BORE **COUNTER-BORE** 

**COUNTER - SINK** FACE ... with THRIFTMASTER

PRODUCTS CORPORATION

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ers of DORMAN AUTOMATIC REVERSE TAPPERS

Subsidiary of THOMSON INDUSTRIES, INC. makers of BALLBUSHINGS + NYLINERS + 60 Cose Sh

For more data circle 429 on Postpaid Card

September, 1961

MODERN MACHINE SHOP

179



## NORTON ESTABLISHES NEW DEPARTMENT

Norton Co., Abrasive Div., Worcester, Mass., has established a new department which will be responsible for developing new products. John C. Ewer will head the department as manager of product and market planning. The department will be responsible for generating and screening new product and market ideas, market research, the initial economic and financial analysis of these ideas, and coordinating this growth effort with other departments and divisions.

Others assigned to the new department are Robert G. Van Keuren, manager of special projects; Warren L. Hardy, manager of marketing research; and Richard H. Merritt, product planning engineer.

modern machine shop

## GISHOLT BRITISH FIRM APPOINTS BOARD DIRECTOR

Gisholt Machine Company (Great Britain) Ltd., 161A Central Rd., Worcester Park, Surrey, England, has appointed S. W. Perkins to its Board of Directors. Mr. Perkins is a director of Wickman Ltd., sole agent in the United Kingdom for Gisholt machines. Gisholt Machine Company (Great Britain) Ltd. is a subsidiary of Gisholt Machine Co., Madison, Wis., which manufactures Gisholt Balancing and Superfinishing Machines for the oversea's market. Manufacturing facilities have recently been expanded to produce Simplimatic Automatic Production Lathes and AR (Automatic Ram) Turret Lathes which will be available in the near future.

modern machine shop

## J & L's FINCH MADE PRESIDENT OF AMERTOOL

At the annual Board of Directors meeting of Amertool Services, Inc., Howard A. Finch, manager of marketing for Jones & Lamson Machine Company, was elected president. At the same meeting, J. A. Gerard, v.p., Cone Automatic Machine Company, was elected vice president. Mr. Finch succeeds Nelson F. Caldwell, v.p., Cincinnati Milling Machine Co., who had been president of Amertool since its organization. Mr. Caldwell now becomes chairman of the board for Amertool.

Amertool Services, Inc., was organized June 16, 1949 by twelve of America's leading machine tool builders. It is designed to provide technical selling and servicing assistance to the foreign distributors of the member companies. as well as long-term financing.

modern machine shop

## CLEVELAND CRANE ESTABLISHES WEST COAST PLANT

The Cleveland Crane & Engineering Co., Wickliffe, Ohio, has established a West Coast Tramrail Division located at 6435 Corvette St., Los Angeles,



## slashes costs on job-shop operations

When an automatic machine enables cost reduction on both mass production and job-shop operations, it's of vital interest to management men. Such a machine is the No. 34 Bardons & Oliver Automatic Cutting-Off Lathe (shown below) busy at work for The Frank G. Hough Co. of Libertyville, Illinois, world famous builders of "PAYLOADER" tractor-shovels and "PAYMOVER" towing tractors.

Hough's methods engineer, Gerald Kannenberg wrote us:

"During the last ten months we've machined over 250 different parts on our new No. 34 B&O Cutting-Off Lathe. An analysis of five typical jobs (see chart) gives some idea of the substantial savings we're getting from this versatile machine. Our operators can economically run lot sizes as small as 50 pieces in our No. 34—and are doing it consistently.

For cut-off operations, we use higher speeds and heavier feeds with the B&O than on any other piece of equipment—and our men find the machine extremely easy to operate. Also, I want to thank you for the fine service and technical assistance we receive from Bardons & Oliver.

We are completely satisfied with the No. 34, and what's more important to us, the machine's production has met our highest expectations."

For the complete details on how Bardons & Oliver Cutting-Off Lathes can boost production and cut your costs, contact the Bardons & Oliver representative in your area or write directly to our main office.

Bardons & Oliver, Inc., 1133 West 9th St. · Cleveland 13, O.

## Cost Comparison—Chamfer and Cut-Off Operations (8 & O Lathes vs Conventional Methods)

No. 34 — 4-inch Collet Capacity

Part Description		Cost Reduction
Bucket Link 2" diameter 17½" length AISI 1018	-	29%
Pivot Pin 1½" diameter 10%s" length AISI 8625		22%
Steering Cylinder Tube 3" diameter 13% <sub>e</sub> " length AISI 1022		25%
Locating Pin ½" diameter 2½" length AISI 1022		50%
Swivel Pin 11/4" diameter 5%4" length AISI 8625		27%



Chamfering and cutting-off 3-inch OD locating lugs at the Hough plant. High-speed steel tooling is being used at 160 SFPM — 0.0075-inch feed per cut-off tool.

BARDONS & OLIVER

For more data circle 430

## news of the industry . . .

Calif. The plant will provide fast service for customers of Cleveland Tramrail overhead materials handling equipment in the Western States. It is equipped with engineering and shop facilities.

Standard equipment will be assembled and stocked for immediate delivery. Limited manufacturing also will be carried on as required to enable "tailoring" of special equipment to unusual materials handling situations. Karl Pamer is manager of the Division. He is a graduate engineer with wide experience in materials handling.

modern machine shop

## CINCINNATI SUB-ZERO PARTICIPATES IN U. S. TRADE MISSIONS PROGRAM

In an effort to establish person-toperson contact between the United

> States and foreign businessmen, the U. S. Trade Missions Program, under the direction of the Department of Commerce, is participating in the International Trade Fairs and Expositions throughout the world. The next on the schedule is the India Industries Fair to be held in New Delhi, India, starting November 15th, and lasting for three months. A complete tool shop and metal treating facility will

## REPCO Time-Saving Too

## ADJUSTABLE V-BLOCK DRILL JIG

Saves Set-Up Time-**Increases Output** 

Here is a versatile and accurate V-Block that makes center and off-center drilling, tapping, and reaming easy and precise. Four-way V-block adjustment simplifies handling a wide range of work. Fast, easy positioning and clamping speed production. A centering locator plug and Tslots in the mounting surface plates assure fast, oasy, on-center adjustment. Drill capacity #80 to %" diameter. Handles stock from 1/4" to 2" diameter.





The REPCO Adjustable rovides fact adjust-ent of the main body to compensate for as much as ½" mochine misalignment. Cuts down on tool wear, breakage, and scrap.



clamping device. Opening limited only to length of chine base. Light, accurate, rigid. Two sizes: 6" am

## CHUCK JAW TRUING-RING SET

This Ring Set saves time, cuts and of baring jaws. With correct diameter rings at hand, you gain hours of productive time. Plated rings range from 1" to 4" by ½" increments. Handly pertype rack keeps rings in elare.







## ROCKFORD INGINIERED PRODUCTS CO.

23rd Avenue and 20th St. . Rockford, Illinois

For more data circle 431 on Postpaid Card



Robert J. Jacobson

## FAMOUS SANFORD MODEL SG NOW MAKES WAY FOR THE ULTIMATE IN MICRO-PRECISION SURFACE GRINDING

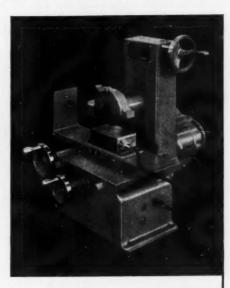
# The NEW IMPROVED SANFORD SG-2

SPECIAL NEW FEATURES—NEW ENCLOSED VERTICAL COLUMN Moving parts are better protected against grit and dirt.

GREATER POWER—
REMOVES MATERIAL FASTER
New motor has higher capacity, yet
is dimensionally smaller, less bulky.

NEW STREAMLINED, MODERN APPEARANCE

NEW WET GRINDING SHIELD Now available to permit easy viewing of work.



The New Improved SANFORD Model SG-2 SURFACE GRINDER for intricate, small parts, dry or wet grinding to less than .0001" tolerance. Combination of extreme accuracy, dependability and high production speed is unmatched by any other grinder—large or small—sold today. Fingertip handwheel and operating switch controls. Meehanite castings used in construction insure maximum durability.

Write for illustrated literature, special attachments data and price list. Representatives in major industrial areas.

SPECIFICATIONS

Chuck surface -3" x 5" or 4" x 6". Table travel -8", traverse 4". Vertical head movement -6". Work area under 4" wheel -6"; with chuck -4". Standard grinding wheel -4" x  $\frac{3}{6}$ " x  $\frac{1}{2}$ ". Spindle speed - approx. 5500 RPM. Motor,  $\frac{1}{4}$  HP, single or 3 ph., dynamically balanced. Dimensions -20" x 24" x  $22\frac{1}{2}$ " high. Net wt. approx. 160 lbs.



SANFORD MANUFACTURING CORP.

692 Rahway Ave.

Union, N. J.

For more data circle 432 on Postpaid Card

## news of the industry . . .

be set up and put into continuous operation for the duration of this Fair.

Cincinnati Sub-Zero Products Ultralow temperature equipment will be an integral part of the processes to be shown. Large chilling chambers, which operate at temperatures in the range of minus 150 degrees F. to minus 200 degrees F. are used as part of modern heat treat methods, and the exposure

to low temperature adds strength and dimensional stability to metals. The unit will also be used to demonstrate simplified assembly methods in which parts are shrunk by low temperature, and then fitted together to form a firm bond without the use of keyways, or other locking devices.

The Cincinnati organization, under the direction of Robert J. Jacobson, president, is constantly developing new uses for ultra low temperature

which reaches into almost every field from the creation of outer space environments, and better metals, to biological processing and advanced surgical methods.

m m s FINN NAMED VICE

PRESIDENT

Harrington-Wilson - Daum Corporation, Mt. Vernon, N. Y., has appointed John P. Finn. vice president in charge of its sales organization. This change was made to meet the ex-



John P. Finn

## **PREDICTABILITY**

A Key to Reliability

Advanced technologies demand accurate predictions of performance in tools as well as materials. Predictability in tools used is basic to reliability in products made.



## CRATEX RUBBERIZED

ABRASIVES can be used with complete confidence. They will perform as expected - engineered for the most delicate and sensitive applications in Deburring, Smoothing, Cleaning and Polishing.

WHEELS POINTS BLOCKS STICKS	Coarse (C) Medium (M) Fine (F)
CONES	Extra-Fine (XF)



radius, touching-up and scores of other operations.



nd blending in to reduce dange fatigue failure.

## Sold through leading Industrial Supply Distributors

FREE! send for the new, informative 22 page Cratex Application Manual, including a complete illustrated catalog.

MANUFACTURING COMPANY, INC.

1600 Rollins Road Burlingame, California For more data circle 433 on Postpaid Card

MODERN MACHINE SHOP

## HOUGHTON MACHINING COOLANTS

## A new advance in synthetic coolants

The first chemical coolants were outstanding in controlling rust and rancidity. They have done a good job and are widely accepted for many metal removal operations.

Because they were not heavyduty fluids, our research department continued its search for a chemically-conceived coolant that could take the place of highly fortified straight oils. The result is new Hocut 3210—a significant advancement in the science of machining coolants.

Hocut 3210 is a highly fortified water-soluble concentrate. It has outstanding anti-weld and extreme pressure characteristics. As a result, it does better those jobs previously reserved for fortified straight oils. Hocut 3210 improves finish at higher speeds without sacrificing tool life. Additionally, it eliminates smoke, oil fog and inherent fire hazards.

Hocut 3210's E.P. characteristics are released by the heat of the cutting operation. This forms a barrier between the tool and the work resulting in a clean cut, free from any welding of chip to tool. Tool life is increased, surface finish improved and parts come off the machine cool enough to handle.

Its heavy duty ability makes it an ideal coolant for tough jobs such as tapping, broaching, form grinding, internal and external thread cutting, thread rolling, plunge grinding, etc.



In spite of all the outstanding features and capabilities of Hocut 3210, its cost is most reasonable. To be up to date on this latest coolant advance, write for complete data or ask your nearby Houghton Man for a test in one of your tough jobs. E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

## <sub>@</sub> Houghton

INDUSTRY'S PARTHER IN PRODUCTION

For more data circle 434 on Postpaid Card

September, 1961

MODERN MACHINE SHOP

185

## news of the industry . . .

panding activity of the company. Mr. Finn has been associated with the company since 1947 and was elected vice president and director of the company in 1956.

\* modern machine shop

## CARL A. BERGSTROM

Carl A. Bergstrom, founder and chairman of the board of The Weldon

Tool Company, Cleveland, Ohio, designer and manufacturer of end mills, cutting tools, adapters and holders, died recently at the age of 79. Founding The Weldon Tool Company in 1918, Mr. Bergstrom pioneered the advantages of end mills having fast spiral flutes for freer cutting and developed the Weldon Shank for quicker removal from its holder. Under his leadership, Weldon Tool originated the "double-end," "cupped-end" and "hollow-ground and double back-off"

end mills. Born in Sweden, Mr. Bergstrom came to this country in 1904. He worked for several leading tool manufacturers before organizing his own firm in 1918.

\* mms

## ANDERSON PRESIDENT OF E. W. BLISS

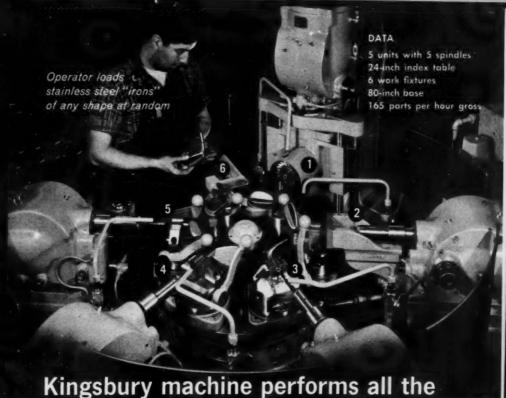
Carl E. Anderson has been elected president and chief executive officer of E. W. Bliss Company, Canton, Ohio, Mr. Anderson was also elected to the Board of Directors of the company, Robert Potter. Chairman of the Board of Directors, has been serving as acting president.

Mr. Anderson was previously the Director of General Manage-



Kenosha, Wisconsin

8109-I 28th Avenue



## Kingsbury machine performs an are

## operations on the HOLE IN ONE chucking

We used a similar headline in a 1931 ad and couldn't resist using it again. In thirty years our machines have changed a lot. But the basic principle is still the same: Combine operations in one chucking for lower unit costs and closer tolerances.

You could probably build your own machine for a simple job like this. It might cost you less. But you might also sacrifice accuracy and reliability.

On this job both the concentricity and diameter of the tapered hole are critical. If the hole were not concentric with the O.D. of the stem, the head would not align with the shaft of the club. So the spindles and work fixtures are in perfect relationship.

The hole diameter is also critical because its taper is so shallow. If the diameter were only .003 oversize, the shaft would go ½-inch too far into the hole and the club would be too short. So we hold the depth of taper exactly.

Even on much tougher jobs, Kingsbury machines turn out good parts hour after hour, month after month. That's because of good basic design and accurate, rugged construction. We run off test samples for your approval before shipment.

To save money in drilling type operations, ask us for a proposal. Kingsbury Machine Tool Corporation, Keene, New Hampshire.

KINGSBURY



## news of the industry . . .

ment Consultation for Ebasco Services Incorporated, world-wide management consulting, engineering and construction firm. He will make his headquarters in Canton, Ohio.

\* modern machine shop \*

## GRIEDER INDUSTRIES MERGES WITH PINES ENGINEERING

Irwin W. Killian, president of Pines Engineering Co., Inc., Aurora, Ill., and Robert E. Love, president of Grieder Industries, Inc., Bowling Green, Ohio, have announced the merger of Grieder Industries, Inc., into Pines Engineering Co., Inc. The manufacture and sale of Grieder high speed tube cutoff machines, automation equipment and special machinery expands the Pines line of tube fabricating equipment. All executives and key operating

personnel, as well as equipment, have been moved to Aurora, and operations are being discontinued at the Bowling Green plant.

Robert Love, president of Grieder, assumes the post of sales manager, cutting and end-finishing lines, on the staff of J. E. Hawkins, Pines general sales manager. Orvill C. Volker, Grieder's vice president and general manager, joins Pines as assistant sales manager, cutting and end-finishing lines. The position of assistant chief engineer of the same product lines is filled by Buford R. Everett, formerly executive vice president of Grieder Industries.

Four standard cut-off machines, plus material handling and tube transfer machinery, are being added to the Pines line of bending machines, bending presses, and tube end-finishing machines. The high production cut-off units range in capacity to a maximum of 4 inch diameter tubing with wall thicknesses to 0.250 inch.

\* modern machine shop

## USE SAWS? HACK • BAND • CIRCULAR KEEP THEM SHARP! Automatically • Economically Learn How—Write Today! WARDWELL Mfg. Co. 3803 Ridge Rd., Cleveland 9, O.

For more data circle 437 on Postpaid Card

## CRUSH ROLL MANUFACTURING FACILITIES EXPANDED

The Twin City Manufacturing Co., 2201 North Washington Ave., Minneapolis, Minnesota, announces the expansion of its grinding wheel crush roll manufacturing facilities. The crush rolls are used on grinding wheel crushers to crush form intricate and precision shapes into grinding wheels.

## GREATER

## with K & K PLUG GAGE SET

20 Reversible Wire Type plug gages. Will inspect the 4 most used holes . . . 1/4", 1/4", 1/4".

ACCURACY TO 50 MILLIONTHS GUARANTEED
High Speed Steel, hardened to Rockwell C 62-64, fine micro finish, fully 1.875" long.

EXAMPLE

Our 1/16" gage will inspect: .0635 .0630 .0625 .0620 .0615 PRICE

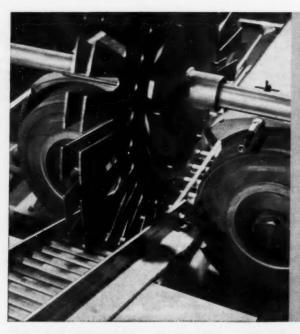
\$50

Replacement \$3.00

Purchase any 5 gages for \$15.00 We will ship F.O.B. Parcel Post

ORDER K & K GRINDING COMPANY (Gage Div.)
TODAY 230 Richardson St. Brooklyn, N. Y.

For more data circle 438 on Postpaid Card



## SPECIAL POWER BRUSHING MACHINE

at Kenmore Machine Products, Inc., Lyons, New York-uses "Ferris wheel" arrangement to index copper tubes past two Osborn 10" TY® brushing heads for deburring and edgeblending. Tubes are rotated through brushing cycle by endless belts. Machine is adjustable for various tube lengths and diameters. Rate for average 1" dia. part: 3300 pieces per hour.

## SAVES \$20,000 per year

## deburring tubing with OSBORN power brushing

Before: this manufacturer of refrigeration components was using off-hand methods to remove endburrs from rough cut-off lengths of copper tubing. Production was too slow...too costly.

Now: this specially-built automatic machine — equipped with Osborn TY\* Master\* Wheel power brushes —deburrs the tubes quickly, economically . . . edge-blends the tube ends smoothly, uniformly. Production is over 8 times faster. Consistently higher quality has eliminated the 100% inspection formerly required . . . with total savings about \$20,000 per year.

If you are interested in boosting

output . . . improving quality . . . reducing costs on your metal finishing jobs of every type—deburring, cleaning, polishing, precision blending—an Osborn Brushing Analysis can show you how. No cost or obligation. Write or call The Osborn Manufacturing Company, Dept. B-36, Cleveland 14, Ohio. Phone ENdicott 1-1900.



Metal Finishing Machines . . . and Finishing Methods • Power, Paint and Maintenance Brushes • Foundry Production Machinery
For more data circle 439 on Postpaid Card



## NEW

## CONTINUOUS-PATH TAPE CONTROLLED LATHES

A line of continuous-path tape controlled lathes are now being built by The R. K. LeBlond Machine Tool Co., Cincinnati 8. Ohio. The new LeBlond "Tape-Turn" Lathe will turn complex contours in addition to tapers, sharp angles, radii, facing cuts and plunge cuts as well as perform straight turning. The accompanying illustration shows six Tape-Turns being run off to better-than-toolroom alignments; they are 20 h.p. models in both 2013 and 2516 sizes, and are available with

30 or 90 spindle speeds from 22 to 1,000 r.p.m. and motor speed variations in 4 to 1 or 20 to 1 ratios.

Also being built with up to 75 h.p. in the 4025 size, these lathes are 100 percent tape commanded with all operator controls at the console. The General Electric Mark Century continuous-path control uses solid state components (no tubes, stepping switches or rotating parts); it is temperature and humidity controlled. This numerical control incorporates a built-in computer for linear or for circular interpolation to provide all standard cuts desired in lathe operation.



View shows first continuous-path tape controlled "Tape-Turn" lathes being run off the final stage of production at the plant of The R. K. LeBlond Machine Tool Company, Cincinnati.

## and

## MATERIALS

Three, four or six station turrets are completely interchangeable to allow for pre-set tooling; 12-position indexing of the turret provides for placement of any tool for machining all types of workpiece geometry.

Tool offset compensation on both axes in 0.0001-inch increments is provided for ease of set-up and tool wear compensation. Precision ball-bearing feed screws are used for both length and cross motion with accuracy resolution on the non-load end. Thread cutting is available as optional equipment by electrical integration of the spindle and feed screw.

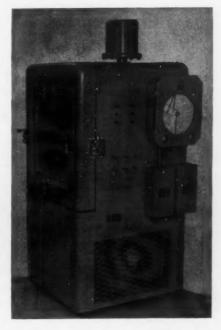
For more data circle 76 on Postpaid Card

\* modern machine shop \*

## VACUUM PRESSURE TEMPERATURE CHAMBER

For the testing and calibrating of pressure sensing and indicating instruments, Cincinnati Sub-Zero Products, 3930 Reading Rd., Cincinnati 29, Ohio, has announced the Model ASU-40-3-HC which is said to provide a pressure range of 20 to 32 inch mercury absolute, over a temperature variance from minus 40 degrees F. to plus 200 degrees F. The stainless steel chamber contains 3 cubic feet of working area. and measures 20 inches high, 20 inches wide, by 12 inches deep. The cabinet, which is equipped with six 1/4 inch stainless steel connectors and 6 Sealtron, 30-amp, terminals, is compact— 64 inches high, 32 inches wide by 32 inches deep. The door, equipped with ballcranks, and a 20 by 20 inch multipane window is especially sealed to assure minimum pressure loss.

The equipment is instrumented with Taylor Fulscope Controllers, and Electro-Pneumatic Interrupters, and operates on 230-60-1. Equipment is custom



View of Cincinnati Sub-Zero Model ASU-40-3-HC Temperature Chamber for testing and calibrating pressure indicating devices

engineered to meet the specific requirements called for by manufacturers of precision instruments; pressures and temperatures are available over a wide range.

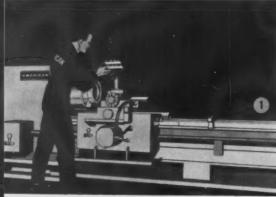
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\* modern machine shop

## TAPE LATHE COORDINATE SYSTEM CUTS SET-UP TIME

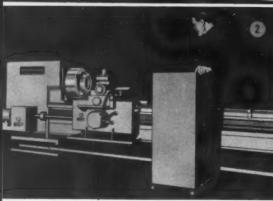
Offered as standard equipment on the line of American Numerically Controlled Lathes, The American Tool Works Company's "Minuteman" coordinate Setup System is designed to reduce cutting-tool/lathe coordination time to an insignificant part of overall setup time. Establishing a constant zero-zero position for succeeding similar pieces, the Minuteman System also maintains this constant position for any given workpiece in case of work stoppage due to power failure or other reason.

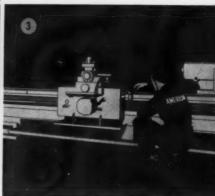
Based on the principle of preset interchangeable tool turrets and an adjustable limit switch stop, the Minuteman can reduce coordinate set-up time to as little as three minutes. Tape-to-tool accuracies of plus or minus 0.0005 inch and repeatability of plus or minus 0.00025 inch are pos-



ed on curvic coupling, and single hold-down bolt is tightened. Square or hexagon toolholder has been accurately preset with correct tools as specified by engineer-programmer. Any number of toolholders may be set up in advance. (2) By console dial, the operator moves the carriage so that knife-edge pointer on apron lines up with scribed line on the bed, establishing "Z" zero position. "X" zero is established automatically by tape. (3) Operator fixes adjustable stop against apron limit switch at a tape selected point on bed out of the way of the work and most convenient to operator. After power failure or other work stoppage, carriage is sent to this known "X-Z" position, where it automatically stops. Work procedes from this point by tape.

(1) Interchangeable turret toolholder is mount-





sible because the square or hexagon toolholders are precisely preset in the tool room, mounted on the lathe on a precision curvic coupling, and all movements of the carriage and apron are controlled by a programming-engineer with the tape prepared either by Flexowriter or computer.

Three simple Minuteman steps place the American lathe into readiness for operation: The operator mounts a preset toolholder on the curvic coupling and tightens a single hold-down bolt. Activated by console push-button, the cross slide moves laterally to its extreme outer position, where a fixed limit switch establishes the "X" position. Then, by console dial, the operator moves the carriage along the bed to a scribed line located at a precise known distance from the spindle nose. At this point, the tool is at zero-zero position. Then, activated by tape, the carriage traverses toward the tailstock a distance predetermined by the programming-engineer, to a position that will not interfere with the work and is most convenient to the operator. This distance will vary with each job, depending on the length of the current workpiece. The operator then slides an adjustable stop along the bed way until it contacts a limit switch on the side of the carriage, and fastens it tight. At this point this adjustable stop becomes an automatic starting place for succeeding identical pieces or should power failure or other cause interrupt work on a given workpiece.

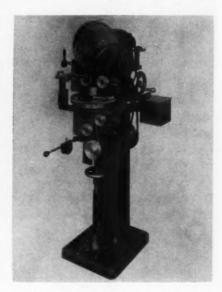
The American Numerically Controlled Lathe, itself especially designed and built for continuous path tape control, has been introduced in six sizes, each controlled by a General Electric Mark Century continuous path control system, using 1 inch, 8-channel punched tape. Models 2010, 2413, 2514, 3019, 4025 and 4732 handle turning, facing, boring and form tool machining. Outstanding features of this American Lathe are the cross and

longitudinal feed units. A tape controlled double electric clutch in each unit operates in conjunction with a tape controlled variable speed d.c. motor and a manual 10-to-1 reduction shift to give 2,000 cross and longitudinal feeds. Extra fine feeds, from 0.010 inch per minute to 20 inches per minute, make low speeds usable on hard, exotic metals and for form tool work. These feeds are by 0.01 inch per minute increments, giving full use of its 35 non-overlapping spindle speeds. For more data circle 78 on Postpaid Card

\* modern machine shop

## **DIE POLISHER**

The Parker-Hartford Corp., 650 Franklin Ave., Hartford, Conn., has announced that it is now manufacturing the Hartford Die Polishing Machine for grinding and polishing contact surfaces of carbide and steel round core extrusion and draw dies. Offering substantial savings in polishing nearly all styles of dies, the die polisher



View shows Hartford Die Polishing Machine

utilizes an endless abrasive belt driven at 5,000 r.p.m. to polish the die parallel to the line of draw. It is suitable for polishing new dies as well as reworking worn dies.

A new development on the die polisher is the angle polishing fixture, which will maintain die manufacturers' specifications on approach, back relief angles and bearing sizes with highest accuracy.

For more data circle 79 on Postpaid Card

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## HORIZONTAL BORING MACHINE

A 37-ton horizontal boring machine has been introduced by DeVlieg Machine Co., Fair St., Royal Oak, Mich.

The machine is part of the H Series. It is called a 5H-144 Spiramatic Jigmil and, through its 5-inch spindle and huge Jigmil configuration, increases substantially the range of precision boring, milling, drilling and other machining operations that can be handled.

Repetitive precision capabilities of the machine tool is partly indicated by the accuracy and alignment of its 24-foot, 33,000-pound, cast-iron bed. In final assembly of the machine, it is flat to within tenths, and a basic accuracy of 0.0001 inch per foot for straightness and alignment on all working surfaces. As an indication of the size work the machine is capable of handling, the vertical movement of the spindle head in the machine column is 6 feet; and its 50 inch wide



DeVlieg 37-ton Horizontal Boring Machine which is called the 5H-144 Spiramatic Jigmil

## For

8-STATION PRODUCTION MACHINING 11/2" BAR AND COLLET WORK CHUCKING

SINGLE POINT THREADING

This is an all new 1½" bar capacity ram type turret lathe with power feeds to all 8 working stations . . . that in addition to bar and collet work also has the versatility to do chucking, and when needed, single point threading. Powered by a 5 h.p., two-speed, geared motor, the new Sheldon 3 R turret lathe provides 16 spindle speeds, 60 different feeds to the carriage and cross-slide, and 180 different feeds to the ram turret.

The turret itself is ruggedly built and accurately machined to provide close tolerance indexing. And for complete ease of operation, it is put under power by simply pressing a push button on

the control panel.

Costs

This new 3 R Sheldon is completely equipped with two-speed motor and electrical controls, coolant system and splash guards, LO spindle nose, large satin chrome dials and hardened bed ways. It also provides an additional cost saving feature—each turret face is drilled and tapped for your standard flange type tooling as well as being bored for your standard 11/2" shank type tooling.

For versatile, accurate machining in either long or short runs, the new Sheldon 3 R provides the answer to low investment cost with high profit operation.

RET LATHE Write for bulletin with complete specifications and tooling data SHELDON MACHINE CO., INC. 4250 N. Knox Ave. Chicago 41, ILL.

Builders of 10", 11", 13", 15" Sheldon lathes, Sheldon Milling Machines, Sheldon Shapers and Sebastian Geared Head Lathes

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table provides a 12 foot travel horizontally. The machine, however, can be provided with tables of the same width for 72. 96 or 120 inch horizontal travel.

Direct power to the spindle of the machine is provided by a 20 horsepower motor, through the Spiramatic spindle head. The latter provides all advantages of a constant mesh gear train, through a method of sliding spiral clutch gears to produce disengagement of the driving clutch, without disengagement of the gear itself. Range of the spindle bar travel is 24 inches. Tool changes are said to be fast and can be made with the spindle bar in any position within its range of travel by a power lock mechanism, which can be locked or released in seconds. Range of the machine's table retraction is 24' inches; also a larger range of index tables is available to meet production requirements. Op-

tional features of the machine include a thermal control system for the main spindle: a depth control attachment consisting of a rotating aluminum turret carrying 24 adjustable stops: and stainless steel way covers.

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mm s

## MINIATURE **BORING TOOLS**

A standard line of miniature, precision ground. solid carbide boring tools has



Atrax Miniature Carbide Boring Tools



Magnetic Angle Iron - Combines universal right angle iron and magnetic chuck. Use on side, back and ends.



Instrument Bench Centers - for fast, accurate setup and checking of miniature and sub-miniature parts.

Taft-Peirce Production and Inspection Equipment is made to precise specifications and tolerances. Parallel within .0001", square within 5 seconds, .00005" per foot surface accuracy - are typical of the certified data you'll find in Catalog No. 511.

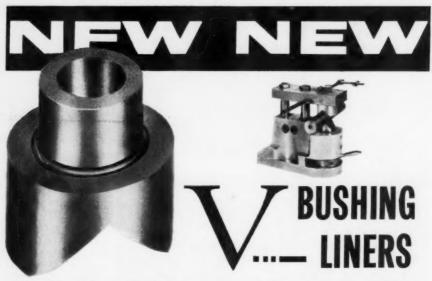
### **PUT TAFT-PEIRCE PRECISION** TOOLS TO WORK FOR YOU.

There are over fifty different types developed to make it easier for you to produce quality products, and to simplify setups and inspection. They are all shown in Catalog No. 511, send for your copy, today. TP1-10

PRECISION

TAFT-PEIRCE

9 MECHANIC AVENUE, WOONSOCKET, RHODE ISLAND For more data circle 441 on Postpaid Card



## To self center cylindrical, square or hex stock for drilling

V for victory over a previously ticklish drilling job . . . new hardened ground Acme Industrial V bushing liners clamp over cylindrical (round bars, tubing, etc.), square or hex stocks . . . instantly, automatically locate dead center. Layout, jig boring eliminated . . . just center punch, drill and ream hole! Acting as a liner for removable bushings, Acme's "V" assures precision centered drilling always.

Available in 2 sets of 3 V bushing liners to accommodate slip bushings with O.D.'s of 3/16", 5/16" and 1/2" in a range from No. 80 drill to 11/32" in A.S.A. or Acme standard sizes. Acme V bushing liners . . . a must for every tool box.

	USTRIAL COMPANY Laflin Street/Chicago 7, Illinois
	Send me complete information on new V bushing liners  Send me the complete Acme Industrial bushings catalog
Name	
Firm	
Address	
City	State

For more data circle 442 on Postpaid Card

been announced by The Atrax Company, 240 Day St., Newington, Conn. The tools have been designed specifically for the precision jig boring of small, close tolerance holes and are available in seven miniature sizes to permit boring from 0.020 to 0.080 inch diameters.

All tools are of solid carbide construction for added rigidity and all top rake and relief angles are highly lapped to mirror-like finishes. The tools are said to be invaluable for the machining of components for aircraft instruments, Gyro Gimbals and other miniature equipment.

For more data circle 81 on Postpaid Card

★ modern machine shop ★

## MICROHARDNESS TESTER

An improved hydrostatic microhardness tester that permits direct, accu-

rate readings within 15 seconds bymeasuring resistance hydrostatically and which eliminates a microscope. conversion charts and complicated tables has been introduced by Newage Industries, Inc., 222 York Road, Jenkintown 26. Pa. An additional fluid control knob has been incorporated, allowing rapid zero adjustments. According to the manufacturer many production and pre-





View shows Newage Microhardness Tester

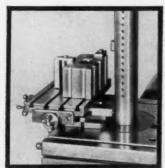
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## HYDRAULIC W& KEYSEATER AND VERTICAL CUTTING MACHINE

does the work of many machines

In addition to a keyseater that cuts internal keyways up to 3" wide x 24" long, the new hydraulic M & M is a handy tool room machine and can be easily adapted to special production jobs other than keyways. A wide variety of internal or external cuts, serrations, grooves and teeth can be rapidly made on this machine. With a combination tilting table and index table (shown on machine at right) straight or tapered bores and accurately spaced multiple keyways or splines may be cut at any degree of the circle. Send us prints of your cutting problems.

> Right: Set-up for internal cutting Below: Set-up for external cutting



BUILDERS OF MACHINERY
SINCE 1854

VERTICAL CUTTING MACHINES

MITTS & MERRILL . 1006 So. Water St. . SAG!NAW, MICHIGAN
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September, 1961

MODERN MACHINE SHOP

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cision parts difficult to check before can now be tested with accuracy, including small flat springs, small wire, tips of cutting tools, surgical needles, wire punches, surface layers, and thin sheet stock. The Newage Microhardness Tester has a 1 kg, load and penetrates as little as 0.000079 inch.

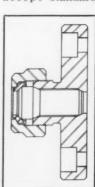
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## **FACEPLATE MOUNTING** FOR COLLET CHUCK

An improved, redesigned faceplate mounting for using the '09 series collet chuck on boring mills, lathes, indexing plates and inspection fixtures has been announced by Erickson Tool Co., 34358 Solon Rd., Solon, Ohio. The collet chuck speeds setup in many operations where machine tools and fixtures are equipped with permanent

> faceplates. With thefaceplate mounted, even massive workpieces, up to 8 inches in diameter, can be centered accurately with plus or minus 0.0005 inch concentricity. Eleven chuck sizes are available, spanning a range from 0.013 through 8 inches. The faceplate mounting has 4 bolt holes.

> The chucks accept standard



Face Plate Mounting for Collet Chuck

## There's a W-L warehouse near you to meet your every requirement promptly

Wheelock, Lovejoy maintains seven strategically-located warehouses. All of them are completely staffed and completely stocked, to fill your alloy steel needs promptly. Standard AISI and SAE steels, and our own famous HY-TEN steels offering advanced metallurgical features at competitive prices, can be had in bars, billets and forgings, in specified sizes, shapes and treatments.

Write today for free Wheelock, Lovejoy Data Sheets, containing complete information on grades, applications, physical properties, tests, heat treating, etc.

## WHEELOCK, LOVEJOY

& COMPANY, INC.

"The Alloy Steel Center"

140 Sidney Street, Cambridge 39, Mass. For more data circle 445 on Postpaid Card

## No Finer Equipment

## **MEASURING FLATNESS**

EASIER . . . MORE ACCURATELY

## LAPMASTER OPTICAL FLATS

So accurate...so easy to get flatness readings down to 1/10 of a light band with the Lapmaster line of Optical Flats. Special manufacturing technique and laboratory control assures uniform flats of highest quality.

Available in certified optical accuracies of .000002" or .000001" ... in either clear fused quartz or Pyrex glass ... either double or single surfaced ... in a full range of standard sizes from 1" through 12" dia.

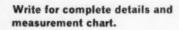


## THE LAPMASTER MONOCHROMATIC LIGHT

There's no easier way to inspect and measure surface flatness. The new Lapmaster

Monochromatic Light has a powerful helium lamp (40 candle power) for sharp reading...light head is adjustable for best reading angle; can be swung completely around to

swung completely around to handle tall parts... is easily portable in self-contained carrying case.





CRANE PACKING COMPANY

6418 OAKTON STREET MORTON GROVE, ILLINOIS (Chicago Suburb) In Canada: Crane Packing Co., Ltd., Hamilton, Ont.

For more data circle 446 on Postpaid Card



"TRICO-MIST"

COOLANT SYSTEM
Increase Production And Tool
Life As Much As 500%.



For drilling, tapping, milling, sawing, grinding, etc. Removes heat from cutting edges of tools and work. Feeds can be increased considerably, finer finishes and accuracy are obtained. TRICO-MIST absorbs heat, thereby quenching it faster than flood coolants which only transfer it. Chips slide freely up the tool face and are blown away automatically. Simple needle valve controls size and volume of mist spray. Attaches to shop air line. Available with one and five gallon containers—single or multiple outlets—single or dual valve control.

SEND FOR BULLETIN 37

TRICO FUSE MFG. CO.

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## new equipment . . .

Erickson hardened steel collets, which are slotted at both ends and employ the Erickson double-angle design. Camming surfaces at each end collapse the collet over its entire length as the nose piece is drawn in. This enables the collet to grip tools such as drills and end mills on the flutes as well as on straight shanks. Each collet collapses a full 1/32 inch. The collets are self-releasing.

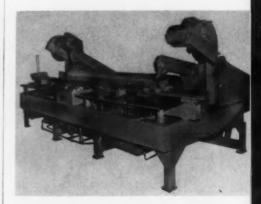
The collet chuck projects beyond the mounting flange only 1 3/16 inch in the smallest size and only 6 29/32 inch in the 8 inch size. The redesigned faceplate mounting is also available for '01 series chucks. Drawbar-operated collet chucks with faceplate mounting are available for special applications.

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\* modern machine shop

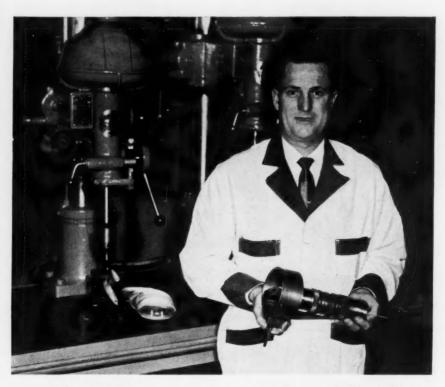
## PIPE CUTTING MACHINE

Stone Machinery Co., Inc., 11 Fayette St., Manlius, N. Y., has developed a new rotating pipe cutting machine with wide application in the cutting of pipe, round solids and tubu-



View of Stone Rotating Pipe Cutting Machine

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## "This Bokum recess tool and holder increased our production by 608%"

"The Bokumatic Model B-1 tool holder and recessing cutter lets us cut 4-7/16" diameter snap ring retaining grooves in passenger car mirrors at the rate of 425 per hour as compared to the 60 we would have gotten on a lathe setup," says M. M. Andrews, president,

Mutual Plating and Die Casting Co., Detroit, Michigan. This is typical of the way in which the standard Bokumatic tool holder can be adapted to meet special requirements. For complete information write for a free copy of the BO-1-60 catalog.

## **BOKUM TOOL COMPANY, INC.**



14775 WILDEMERE AVENUE DETROIT 38, MICHIGAN

For more data circle 448 on Postpaid Card

lar extrusions of virtually any length and dimension. Custom developed to trim 11-foot lengths of nickel chrome alloy centrifugally cast steel pipe ranging from 45% to 123/4 inch diameter, the initial machine in this series cut size 103/4 inches o.d. by 95/8 inches i.d. in less than three minutes. Using a 16 inch SNS 245 F abrasive wheel, a precise, square end cut was produced with no change in characteristics in the metal.

The Stone Pipe Cutting Machine is equipped with a full 10 h.p. TEFC ball bearing, geared-in-head motor at each end. Centrally located control panel gives operator complete electric and hydraulic control over each cutting head, rate of feed, elevation, depth of cut, speed and direction of rotation. Stock is held in position on opposing banks of self-centering hard rubber faced support wheels spaced

the entire length of the machine and by pressure rollers located near each cutting head. Extreme accuracy is achieved by the use of a spring loaded kerf follower located directly under cutting wheel at base of stock, A calibrated scale reading from each blade, plus movable work stops, allow easy positioning of stock for repeat cuts. Dust and cuttings are exhausted to rear through special housing.

For more data circle 84 on Postpaid Card modern machine shop

THREADED

## EXPANDING MANDRELS

Threaded expanding mandre's, designed to hold work on the pitch diameter of internal threads are now available in Unified Coarse Thread Series (UNC) from 1/4 inch-20 to 21/2 inch-4 and in Unified Fine Thread Series (UNF) from 1/4 inch-28 to 11/2 inch-12. Produced by LeCount Tool Works,



SPRING PLUNGERS are now available in four types and thirty-four sizes. Black Pentrate Nose with standard spring pressures, 6-32 thru 1"-8 threads. Cadmium Plate Nose with light spring pressures, 6-32 thru 1"-8 threads. Black Nylon Nose with standard

spring pressures, 8-32 thru \( \frac{5}{8}''-11 \) threads. White Nylon Nose with light spring pressures, 8-32 thru 5/8"-11 threads. Northwestern Tools, Inc. 118 Hollier Ave., Dayton 3, Ohio.



PLASTIC BALL KNOBS with brass inserts are now available in four diameters and twelve threads sizes. 3/4" diameter with 10-32 threads. 1" diameter with 1/4-20, 1/4-28, 5/16-18 or 5/16-24 threads.  $1\frac{3}{8}$ " diameter with  $\frac{3}{8}$ -16,  $\frac{3}{8}$ -24,  $\frac{1}{2}$ -13 or  $\frac{1}{2}$ -20 threads.  $1\frac{7}{8}$ " diameter with 1/2-13, 1/2-20 or 5/8-18 threads. Northwestern Tools, Inc. 118 Hollier Ave., Dayton 3, Ohio.



SWING "C" WASHERS complete with shoulder screws, are now available in four sizes for 3/8", 1/2", 5/8" or 3/4" bolt sizes. Write or call today for your free new 16-page catalog. Catalog includes tracing templates of jig and fixture components. Northwestern Tools, Inc. 118 Hollier Ave., Dayton 3, Ohio.

For more data circle 449 on Postpaid Card



CRITERION MACHINE WORKS
758 W. 16th STREET, COSTA MESA, CALIFORNIA

Inc., P. O. Box 252, Cheshire, Conn., the threaded mandrels (Type T) are similar in construction to the standard LeCount Expanding Mandrels and are guaranteed accurate to 0.0002 inch T.I.R. Mandrels with left-hand threads, and sizes larger than those indicated are available as "Specials."

LeCount Threaded Mandrels can

Measuring roughness of parts that are



LeCount Threaded Expanding Mandrel

be used for machining, grinding, balancing, inspection, and so on, where the workpiece must be held on the pitch diameter of an internal thread

and the o.d. must be held concentric, or where the shoulder (or end) of the workpiece must be held square to the internal thread. Since the jaws of the LeCount Expanding Threaded Mandrels remain parallel through its expansion range, parts can be machined and inspected to extremely close tolerances for both concentricity and squareness in relationship to the pitch diameter of an internal thread.

For more data circle 85 on Postpaid Card

TOOL	POS1
GRINI	DER

A tool post grinder which is said to eliminate the need for bulky electric motors, belts and pulleys is being

## What's Your Toughest Surface Measurement Problem—

Extra-smooth?	Inside small ID's?
Short or narrow?	Remotely located?

- ☐ Concave or convex? ☐ Of critical importance? ☐ Measuring height and width of waves, bows, steps and
- other widely-spaced irregularities?
- ☐ Measuring individual pits, flaws, scratches?
- ☐ Measuring waviness around surfaces of rotation?
- Other:\_

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ADDRESS\_\_\_\_

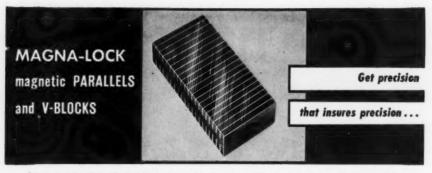
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MICROMETRICAL
MANUFACTURING COMPANY
A SURSUBARY OF THE MINDER COMPONION

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Largest selection of standard sizes. No rivets or dowels. Positive welded non-shift laminations. 1/32" non-magnetic steel laminations and 1/4" low-carbon steel laminations. No plastic or soft filler. Shipped in standard cartons, wood boxes at extra cost. Special parallels and V-blocks on request.

PLACE YOUR ORDER NOW FOR PROMPT SHIPMENT.

PARALLELS ground si	ngly or in pairs
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Number	Dimensions	Wr. Euch	Price Each	Price
M-:	36 x 1½ x 3	1 1/4 lbs.	\$11.00	\$20.00
M-2	34 x 1 ½ x 6	21/4 lbs.	17.00	30.00
M-11	% x 2 x 4	21/2 lbs.	17.50	31.00
M-153	1 x 11/2 x 3	11/2 lbs.	13.00	23.00
M-22	1 x 2 x 2	11/2 lbs.	12.00	21.00
M-23	1 × 2 × 3	2 lbs.	15.00	27.00
M-3	1 42 44	234 lbs.	18.00	32.00
M-4	1 x 2 x 5	4 lbs.	19.00	34.00
M-28	1 x 2 x 8	5% lbs.	22.00	39.00
M-255	1 x 21/2 x 5	31/2 lbs.	20.00	36.00
M-34	1 x 3 x 4	31/4 lbs.	20.00	36.00
M-5	1 ×3 ×6	6 lbs.	26.00	46.00
M-38	1 × 3 × 8	71/2 1bs.	37.00	66.00
M-312	1 x 3 x 12	12 lbs.	52.00	93.00
M-356	1 × 3½ × 6	6 3/4 lbs.	32.00	57.00
M-6	1 x4 x4	51/2 lbs.	22.00	39.00
M-46	1 = 4 = 6	B lbs.	37.00	66.00
M-48	1 x4 x8	91/4 lbs.	45.00	81.00
M-412	1 x 4 x 12	16 lbs.	73.00	131.00
M-510	1 x 5 x 10	18 lbs.	77.00	138.00
M-610	1 x6 x10	20 lbs.	79.00	142.00
M-612	1 x6 x12	24 lbs.	100.00	180.00
M-7	1 ×8 ×8	22 lbs.	86.00	154.00
M-8	1% x 1% x 41/2	31/2 lbs.	19.00	34.00
M-9	13/4 x 2 x 3	1 1/2 lbs.	17.00	30.00
M-248	2 x 4 x 8	18 lbs.	86.00	154.00

## V-BLOCKS 90° V and 45° from centerline

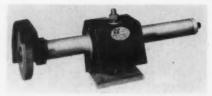
Size No.	Height, Inches	Width, Inches	Longth, Inches	Price Each	Price Pair
MV-1	134	21/2	21/2	\$38.00	\$68.00
MV-2	1 3/4	21/2	4	58.00	102.00
MV-3	2	6	6	96.00	172.00
MV-4	136	21/2	6	72.00	129.00

TOOL ROOM SUPERINTENDENTS: Make your own grinding Magna-Lock Standard-size Parallels. Make your own grinding fixtures from

Hanchett MAGNA-LOCK CORPORATION BIG RAPIDS, MICHIGAN, U.S.A.

For more data circle 452 on Postpaid Card

marketed by Gilmore Industrial Grinders, Inc., 6523 Eppes St., Houston 17, Texas. The Gilmore T-P Tool Post Grinder uses the same quill for either internal or external grinding operations. Complete visibility during all grinding operations is assured, because the grinder is operated by a onehorsepower air motor completely enclosed inside the quill. This motor has



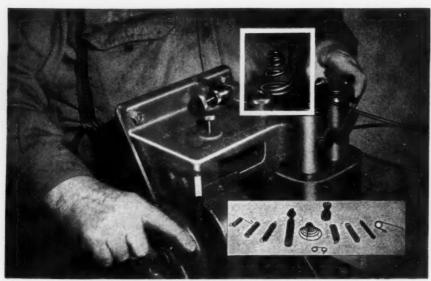
View shows Gilmore T-P Tool Post Grinder

a top speed of 18,000 r.p.m. and operates through 4:1 reduction gears to produce a maximum spindle

speed of 4,500 r.p.m. Grinding speed can be changed simply by adjusting the air supply valve. The complete motor and quill assembly is only 17/8 inches in diameter so that full visibility of the work is maintained even during internal grinding operations.

The quill assembly is mounted on the lathe compound by means of a support block which includes an eccentric. Only one bolt is needed to lock the eccentric and hold the assembly on the lathe compound. The eccentric provides a 1/8 inch vertical adjustment of the quill, assuring ease in moving the Gilmore Tool Post Grinder to lathes of varying



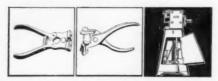


## Any spring made fast in your shop!

For a replacement or experimental spring, any shape, diameter or pitch from flat or round wire sizes .005" to .125", you can produce it in a matter of seconds with Perkins Precision Spring Coiler. You eliminate arbors, yet turn out precision springs — torsion, compression, extension, tapered, or special springs, coiled either left or right hand, in any desired length, any diameter from 3/32" to 12" and larger, with or without initial tension, and with

open or closed ends. Eliminate expensive special orders and costly production delays! Make your own springs to exact specifications as replacements or experimental work. Make them fast, right in your own shop!





Starrett adjustable jaw cut nippers (left) and Gardener Hook-Kon spring looping tool (center) — handy, precision, time-saving accessories for spring coiling. Perkins Spring Coiler available as bench model or power model shown here, (right) for tool shop or continuous runs.

4	Perkins Machine and Gear Co. Special Machinery Division, Dept. D 2 W. Springfield, Mass. Please send information and prices on Perkins Spring Coiler. Hand Model  Power Model
1	NameTitle
(	Company
1	Address
(	CityState

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sizes. There are no belts or pulleys to change in such a move.

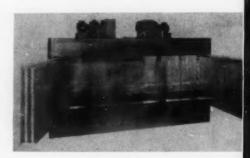
The absence of an external motor and drive assembly gives the machinist full accessibility to his work, including adjustment of the taper attachment at the rear of the lathe.

For more data circle 86 on Postpaid Card

\* modern machine shop

## **ELECTRIC OVEN**

Unusual dimensions, carefully directed recirculation of chamber atmosphere, and stainless steel lining throughout are features of an electric oven developed by Cooley Electric Co., 31 South Shelby St., Indianapolis, Ind. The oven has inside chamber



Electric Oven with Stainless Steel Lining

dimensions of 96 inches wide by 30 inches high by 24 inches deep, and has an installed capacity of 48 Kw. at 230 or 440 volts 3 phase. Heating elements are Cooley "Thermoshell" units located in the rear wall of the oven behind a stainless steel baffle.

## High-Output with ROUSSELLE

## DOUBLE-CRANK PRESSES



No. 48 OBI with "Econo-Air" clutch.

SPEED UP PRODUCTION with these versatile 40-ton presses. Large bed and ram areas make them ideally suited to handle wide rolls or sheets... do multiple punching, steel-rule die work and other high output operations. For rapid, shockless starting and stopping, presses can be equipped with electrically controlled "Econo-Air" friction clutch... Ask for new catalog.





STRAIGHT SIDE - Die space up to 24 in.; bed space up to 6 ft. between uprights.

Choice of over 30 models and types in 5 to 60-ten sizes

SERVICE MACHINE COMPANY
Mirs. of Rousselle Presses

2310 WEST 78TH STREET . CHICAGO 20, ILLINOIS

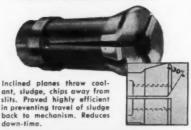
Rousselle Presses are sold exclusively through Leading Machinery Dealers.

For more data circle 455 on Postpaid Card

#### ALL SHEFFER STANDARD COLLETS HAVE SHEFFER CLOVER-LEAF GRIND



#### NOW AT STANDARD PRICES SHEFFER SELF-CLEANING COLLET\*



## SHEFFER PRODUCTS ARE BEST

#### SHEFFER "ECONOMY" PUSHER\*



Dual bearings for positive grip with less pressure. Gives more pieces per bar. Available in solid bronze for soft finished surfaces. Also conventional and "squirrel cage" pushers.

## WRITE FOR YOUR COPY OF OUR NEW COLLET PRICELIST AND CATALOG.

UP-TO-THE-MINUTE INFORMATION. EASY TO READ.

#### SHEFFER "BB" PUSHER HAS\* SIMPLE ONE-PIECE INSERT



Single insert holds stock in most cases to full rated capacity. Reduces stress and wear. Easy to stock and assemble. Made in several materials. Also available with 3-piece pads. SHEFFER HAS COMPLETE LINE OF SCREW MACHINE ACCESSORIES



Collet tubes and pushers, tubes with spools, etc., collet tube adjusting nuts, pusher tube bushings for all automatic screw machines.

\*Patent applied for

Write for our catalog

SHEFFER COLLET CO.

MEET THE DEMAND FOR PRECISION WITH TOOLS THAT MAKE PRECISION EASY

For more data circle 456 on Postpaid Card

Two blowers force the chamber air down over heating elements to a plenum chamber below the cast grid hearth and then up through the chamber to return to the blowers.

Operating temperature is 1,000 degrees maximum and is closely controlled by means of a thermocouple-type pyrometer with temperature variations within the limits of the instrument. Ovens of this type can be furnished in other sizes, either as standard units or built to specifications.

For more data circle 87 on Postpaid Card

modern machine shop

#### DRILL AND TAP HOLDER

Giddings & Lewis Machine Tool Co., Davis Div., Fond du Lac, Wis., has introduced the Davis Tap-Leader, a drill and tape holder, which permits power feed tapping operations on

> horizontal- and vertical - spindle machines not equipped with thread leads or not having leads that match those of the tap. It also absorbs backlash in the machine feed gearing when the tap is reversed. The tool is available in two standard models. Nos. 12 and 13. to handle taps from 1/4 to 11/4

## TORIT COLLECTORS

lessen employee grievances

save valuable dusts

Torit Dust Collectors keep plants clean . . . an important factor in protecting employee health and morale—and in lowering absenteeism and employee grievances. Economical, too, these units are portable. They cost a fraction of central built-ins and are not limited to certain areas. They save heat by recirculating clean, filtered air. And, as in tungsten carbide manufacturing or diamond grinding operations, they pay for themselves in days with the valuable dusts they recover.



Torit Cabinet Cloth-Filter Model, High efficiency collection of all types of dust. Particles are trapped on fine-woven cloth filters—99%+ efficiency (by weight). Clean filtered air is drawn past the motor and blower to keep it cool.

Self contained, portable steel cabinets, Removable doors allow ready access to filters, motors, and blowers. Filters are chemically treated for spark resistance and sealed against leakage. These compact units give maximum filter area in smallest possible space. Capacities range up to 2100 cubic feet per minute. Larger units are built on special order. Prices start at \$230.



**Drill and Tap Holder** 

\*For a FREE handbook detailing specifications and performance data of Torit Dust Collectors and applications, write Dept. 729.

#### TORIT MANUFACTURING CO.

1133 Rankin Street . St. Paul 16, Minnesota For more data circle 457 on Postpaid Card

## WHERE CAN YOU USE THESE "TIME SAVERS FOR TOOL MAKERS"?





UNIVERSAL BORE GAGE is a simple holder to which any "Last Word" type indicator can be attached. For checking bores, 0 ring or snap ring grooves, thread reliefs, undercuts, etc. Range, with extensions, .200" to 6.000". Satin finish. With 4 pair of points, wooden case, extensions, indicator, \$48. Without indicator, \$24.

CUTTER GRINDING FIXTURE for surface grinders. Sharpens all standard milling cutters up to 6" diameter. Meehanite casting, ground working surfaces. With bushings for 7/4", 1" or 11/4" bores, \$49.

SWIVEL WHEEL DRESSER swings from 0 to 8" above chuck without cranking grinder spindle up and down. Adjusts either side of wheel, then locks.

Precision ground, semi-steel base and arm casting. Serated diamond chucks of hardened steel. With diamond, \$49.



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for Tool Makers"...
packed with time
and work-saving
tools you can put to
good use in your
toolroom and production line.
Write for
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today.



MONTGOMERY & CO. Inc. 411 Morris Ave., Springfield, N. J., MErcury 5-7786

All Montgomery tools are shipped on approval for a 10 day free trial. We pay freight if check is sent with order.

For more data circle 458 on Postpaid Card

## JIFFY PADDED SHIPPING BAGS





#### JIFFY PADDED SHIPPING BAG-

the all-in-one shipping unit — provides cushioning, moisture-resistance, insulation, and heavy duty protection. Saves labor, time and materials. Handy teartape opener for easy removal of contents.

Send for your FREE SAMPLES today!



JIFFY MANUFACTURING CO. 360 Florence Avenue Hillside, N. J.

For more data circle 459 on Postpaid Card

#### new equipment . . .

inches in diameter. Depending upon the size of the tap used, maximum depths of full thread range up to 2 inches. Special Tap-Leaders also are available for applications requiring a greater capacity than that provided by the standard models.

Models 12 and 13 feature quick-change collets and chucks which are said to make tool changing fast and easy—tools lock instantly in place, are released just as quickly. All collets are interchangeable with those used on the Davis Tap-Saver (automatic torquesetting and drilling heads). A float-lock arrangement converts the tools to rigid drill holders. By pushing a plunger on the side of the tool body, the operator locks the tool for drilling operations. Pushing the plunger from the opposite side of the tool body resets the tool for tapping.

For more data circle 88 on Postpaid Card

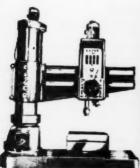
\* modern machine shop

#### TAPPING UNIT

The Electro-Mechano Co., 265 East Erie St., Milwaukee, Wis., has introduced a small automatic tapping unit



Electro-Mechano Automatic Tapping Unit

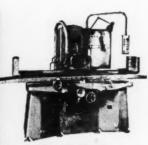


#### CASER RADIAL DRILL

Column: 8" to 29" diameter Arm: 2'6" to 10'
Drilling Capacity: 1" to 4" steel AVAIL: ON TRAVELING BASE



- 1. QUALITY
- 2. LOWER PRICE
- 3. SERVICE
- 4. DEPENDABILITY



BLOHM HYDRAULIC HORIZONTAL SURFACE GRINDERS

12" x 20" to 12" x 60" also 20" x 40"



#### MOESSNER-REKORD

Heavy Duty Metal Contour Bandsaws from 13" to 37" throat



Coast to Coast Dealer Organization

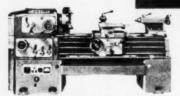
MACHINE TOOL CO., INC.

48-15 Northern Boulevard Long Island City 1, N. Y. RAvenswood 1-1134



#### CASER SINGLE SPINDLE AUTOMATIC LATHE

Bar Capacity 1"



#### CLOVER ENGINE LATHES

SWING 14" to 41" DISTANCE BETWEEN CENTERS 40" to 320" HP 4 to 25



#### ATOMIC SHAPERS

Stroke: 16", 20", 24" and 28"

For more data circle 460 on Postpaid Card

with a capacity range from No. 4-40 through No. 10. The tapping unit has an electric motor driven spindle with air cylinder for the feed. A single direction motor is used with reversing attachment. The tap speed range is 750 to 3,000 r.p.m. in seven steps. It is a compact unit and therefore can easily be built into special machines. For more data circle 89 on Postpaid Card

### CAM-OPERATED PROGRAM CONTROLLER

Barber-Colman Co., Wheelco Industrial Instruments Div., 44 Loomis St., Rockford, Ill., has announced a program controller which has been designed for accurate, reliable and automatic reproduction of any predetermined program. Temperature, speed, strain, flow—any variable which can be resolved into a millivolt signal can be controlled in almost

unlimited patterns by the electronic, roundchart cam-operated unit. Metalworking, ceramics and glass are but a few of the wide variety of process applications. Design simplicity. complete flexibility, close control, precise time patterns, fast and convenient accessibility, reliable set point action and operational use are a few of the manv features.

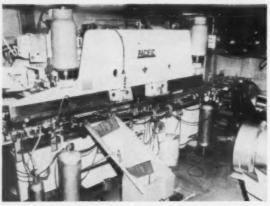
The controller precisely maintains predetermined time patterns. Full-



Wheelco Cam-Operated Program Controller

## PACIFIC HYDRAULIC...THE FAST PRESS BRAKE produces

40 shingles per minute automatically



To match most production requirements, Pacific Hydraulic press brake can be set to a short stroke to eliminate all wasted motion and to cycle at high speeds. At Precision Industries, Honolulu, a single 150 ton Pacific produces, completely automatically, 40 shingles of 20 gauge aluminum every minute combining 7 separate operations with each stroke of ram. The press has an automatic feed including coil cradle, straightening roll, air slide feed, progressive dies and air ejector. Any plant, large or small, can handle a variety of jobs more economically on a Pacific. Write for brochure.

#### PACIFIC PRESSES & SHEARS

848 - 49TH AVE., OAKLAND, CALIF.: also MT. CARMEL, ILL.

For more data circle 461 on Postpaid Card

scale rise can be accomplished in 30 degree rotation. The cam contour is picked up by a cam follower arm. Position of the arm is transmitted through the "electronic link" to the set point which is connected to the control form. The permanent, easy-toread round chart can be removed at any time without interfering with the program cycle.

All components are quickly and conveniently accessible. The hinged

chassis opens wide for easy maintenance. Cam support and drive arm unit swing out from the main frame a full 90 degrees for easy chart change and frame chassis swings out 120 degrees for easy accessibility. A synchronous motor, equipped with a start-stop switch, drives the chart and cam.

For more data circle 90 on Postpaid Card m m s

#### TITANIUM SHIMS

Laminted Shim Co., Inc., 3305 Union St., Glenbrook, Conn., has



Laminated titanium

announced that titanium may now be used in the manufacture of laminated shims. Much in the manner of manufacturing laminated shims of stainless steel, aluminum or brass, multiple 0.003 inch layers of titanium are now plastic bonded to each other and, if desired, also to a single, thicker sheet of titanium.

It is from this securely laminated and bonded titanium material that laminated shims can now be custom



cient, compact design and has developed more than 50 stand-

ard Dustkop collectors. Each is job-tailored to most grinding, buffing or finishing operations—as well as many other types of service. Write for illustrated brochure that helps select your tailored Dustkop unit. Also a complete line of mist collectors

MANUFACTURING COMPANY DUSTKOP 1398 EAST CHURCH ST., ADRIAN, MICHIGAN Stops Dusto

For more data circle 462 on Postpaid Card

September, 1961

MODERN MACHINE SHOP

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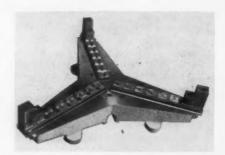
built to specifications. Shims of this material not only will fulfill weight saving and high tensile strength requirements for spacecraft and missile component assemblies, but feature the same peelability advantages as shims made of other metals.

For more data circle 91 on Postpaid Card

modern machine shop

#### WORKHOLDING DEVICE

A positioning device has been introduced by the Skinner-Horton Chuck Div., Skinner Precision Industries, Inc., New Britain, Conn. The standard size of this three-jaw, self-centering positioner has a capacity from 3 to 40 inches; larger and smaller sizes are available on special order. The manufacturer describes this as a fast, accurate positioning device for such appli-



Skinner Three-Jaw Workholding Device

cations as welding and flame hardening. Hardened steel jaws open and close at a turn of a wrench and work is automatically centered.

The holding device mounts on headstock, turntable, or positioner, and can be fitted with special jaws for special applications. The heavy-duty chuck is sealed against dirt and abrasive materials and stands up under rugged use. For more data circle 92 on Postpaid Card



to its interlocked power and light circuits, will not permit a machine to be operated when the Shield is not in a full protective position. Write for complete information today.

Junkin Safety Appliance Co. 3121 MILLERS LANE . LOUISVILLE 16, KY.

For more data circle 463 on Postpaid Card



#### OFF-THE-SHELF DELIVERY

A complete selection of heat treated alloy steel dies to fit all standard press brakes. Fine finished surfaces. Hardness in Rockwell C25-28. Specials also supplied on request.

> See your Di-Acro dealer or write for information and prices.

pronounced "die-ack-ro"



-ACRO CORPORATION

For more data circle 464 on Postpaid Card

September, 1961

#### HEIGHT GAGE

The Van Keuren Company, 176 Waltham St., Watertown, Mass., has announced a "Hyt Size Gage" in the 12 inch size which will measure from a range of 0.250 inch to 12 inches, accurate to 0.000050 inch on any measurement. The ability to set any dimension to 0.0001 inch steps from 0.250 inch to 12.000 inches enables the operator to set exact dimensions, the manufacturer says, accurate to

0.000050 of an inch, and eliminate the need of wringing gage blocks which is time - consuming. The company states that through the use of a transfer gage it is possible, in a matter of seconds, to be ready to inspect drill jigs, lathe fixtures, gears, cams, splines, contours and many other daily routine shop operations. A spring loaded non - rotating



Van Keuren Height Gage

measuring column is made up of a series of 0.250 inch and 0.750 inch spacers lapped to gage block accuracy. Since the 0.250 inch spacers are lapped flat and parallel, the inspector can take readings from either the top or bottom side of the spacers. Due to spring loaded construction of the measuring column, all chance of backlash is eliminated because the pressure in the measuring column is equal at either end of the 1.000 inch travel of the micrometer screw.

For more data circle 93 on Postpaid Card



#### **DIE CUT SPROCKETS AND HUBS**

Dayton Rogers Manufacturing Co., 2824-13th Ave., South, Minneapolis 7, Minn., has introduced die-cut sprockets, in various sizes, with teeth numbers ranging from 11 to 36, in larger size sprockets, and in smaller size sprockets teeth varying from 12 to 112. The plate sprockets can be converted to hub sprockets with this



View of Dayton Rogers Die Cut Sprockets

new design of multiple spline assembly construction, eliminating welding and assuring a stronger power press assem-

> bled unit when the sprocket design requires a hub bored to the desired size and specifications. Sprockets are adapted to both high and low speed operations. All sprockets are chamfered on both sides, assuring trouble-free operations for all roller chain applications.

For more data circle 94 on Postpaid Card

\* mms

#### SLIDE TABLE

Willhammer Machine Products, 801 Mc-Henry Ave., Woodstock, Ill., has announced a production slide table which can be instantly attached to milling machines, drill presses and other machine tools for production work, according to the company. It can also be used as an auxiliary layout



There's no matching Benchmaster variety and versatility. For example,

Benchmaster makes 17 different press models with many variations of each... in stroke length, shut height and throat depth.

This 8 ton BENCHMASTER DEEP THRGAT PRESS is typical of Benchmaster strength and ruggedness. It punches to the center of a 24" circle, comes in a choice of 3 shut heights: 9", 12" or 15" exclusive of bolster plate. Stroke lengths to 3".

OTHER BENCHMASTERS furnished in 2, 5, 8 and 10 ton models in Plain OBI, Back-Geared, Deep Throat, Half Press, Fixed Bed Gap Frame, and Multiple Ram models.

WRITE FOR CATALOG, prices and recommendations.





1835 W. Rosecrans Avenue • Gardena, California For more data circle 466 on Postpaid Card



View of Willhammer Production Slide Table

table. The slide table is particularly applicable to screw machine depart-

ments for secondary operations. Specifications are as follows: size of table, 4 inches by 14 inches; T-slot, 7/16 inch; table travel, 51/2 inches; height, 1 13/16 inch; weight, 38 1b. approximately; base, 4 inches by 111/2 inches long overall with 8 inches of dove-

For more data circle 95 on Postpaid Card mms

#### RELIEF GRINDING MACHINE

A floor model relief grinding machine that performs both as an ultra-precise drill point grinder and versatile cam relief grinder has been announced by Harig Mfg. Corp., 5765 W. Howard St., Chicago 48, Ill. As a drill point grinder, the machine grinds original

points and resharpens virtually every

style drill point. This includes split crankshaft points, Helixpoints or spiral points, chisel or conventional, sheet metal, three and four lip coredrills and limitless modifications such as missile points for drilling exotic metals, printed circuit points and various other specialized points. Indexing and concentricity accuracy are in "tenths." Change-overs to different sizes, angles and styles are said to be

# BAR, PIPE AND ROD

Double-Face Models for Center Floor Use. Single-Face for **Against Wall** Locations

Ideal storage for bars, pipe, rods, posts - all long parts. Arms adjustable every 11/2" with spacing

as close as 71/2". Uprights positioned to permit either manual or crane loading. Built of heavyduty steel. Finish, durable gray baked-on enamel.

Write for free 100-page Lyon Catalog.

#### LYON METAL PRODUCTS, INC.

General Offices: 113 Monroe Ave., Aurora, Illinois Factories in Aurora, III.-York, Pa.-Los Angeles Dealers and Branches in All Principal Cities

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### Every Shop Should Own One



## KNURLMASTER Hand Knurler



For small production runs on ½" to 1" stock. Exclusive screw design gives perfect knurl pattern. Furnished with 3 hardened straight or diamond pattern knurls of standard ½" dia. Forged steel frame is self-centering. Write for illustrated folder.

#### ROCKWIN MANUFACTURING CO.

80-D MAGNOLIA AVE., WESTBURY, L. I., N. Y. For more data circle 468 on Postpaid Card

new equipment . . .

accomplished in seconds. Web thinning and split points are done on a separate independent slide adjacent to a second grinding wheel. The machine is intended for users of mixed varieties of tools or for continuous production.

As a cam relief grinder, versatility of the machine is extended to rapidly grind, with eccentric relief, such basic tools as step drills with or without marginal relief, taps, countersinks of every style including uniflutes, center drills, double margin drills, sub-land drills, porting and valve seating tools, and special tools with forms and contours. Sharp corners on step-drills within 0.001 inch and with no undercut are accomplished by a unique system of grinding above center which, it is claimed, permits the use of large diameter grinding wheels for this formerly difficult class of work.





Harig Dual Purpose Relief Grinding Machine

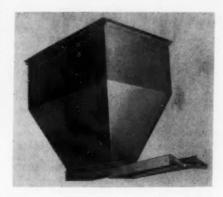
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The range of work performed is from 1/64 inch through 1 1/32 inch, left or right hand. There is no limit to flute numbers. A full set of 66 precision collets specially designed for gripping on flutes come with the machine. An optional headstock converts the machine to an all-around end mill and milling cutter sharpener. For more data circle 96 on Postpaid Card

\* modern machine shop \*

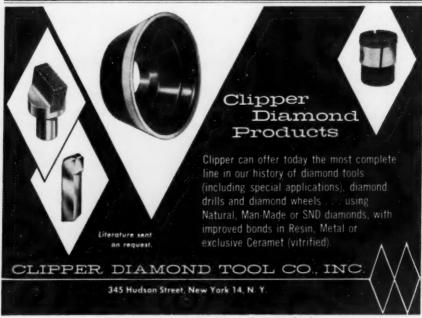
#### **DUST COLLECTING UNITS**

A change in the hopper design of dust collection units has been announced by Aget Manufacturing Co., 1398 Church St., Adrian, Mich. Designed to eliminate build-up and bridging of filtered materials at the outlet point of the hopper, as well as clogging and jamming of the dump slide, the Aget Hopper incorporates a cam action gate. This radical design provides a terrific force which breaks



Aget Dust Collector with new hopper design

the gate loose under practically any conditions, and also embodies a receding and sliding action of the gate itself which facilitates the dumping action. A wedging effect in the guides and supports of the slide is said to guarantee a positive seal, regardless of wear.



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September, 1961

MODERN MACHINE SHOP

223

The cam action gate has a dump opening of 12 by 24 inches, which greatly speeds up the dumping cycle. For more data circle 97 on Postpaid Card

\* modern machine shop

#### TRACK FOR OVERHEAD MATERIALS HANDLING SERVICE

Cleveland Tramrail Div., The Cleveland Crane & Engineering Co., Wickliffe, Ohio, has announced the introduction of Tarca Track, a heavy-duty track for overhead materials handling service. Tarca Track has been designed to withstand heavy, swinging, jerky loads and provide a smooth trouble-free road for materials movement. It has been engineered to attain maximum strength with minimum weight. The track is a compound section consisting of a steel flange and web, and

an especially rolled high carbon alloy steel rail. These parts are welded continuously from end to end under carefully controlled conditions to form a combined section free of stress concentrations. The parts are carefully proportioned to produce a perfectly balanced designed for loads under all conditions.

The rail provides great strength and has a hard, flat, raised tread or running surface. This tread is smooth and becomes highly polished in service, assuring continued easy operation of cranes, carriers and trolleys. The hard, raised-tread surface prevents the rail flanges from peening down, due to continuous rolling action of the wheels. Tarca Track is fabricated in a large number of standard sizes ranging from eight to twenty inches deep. Special sizes and greater depth tracks can be made for unusual applications when required. Tarca Track rail dimensions match with existing

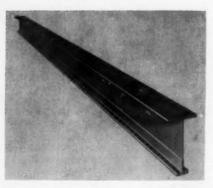


VOGEL

TOOL AND DIE CORPORATION

1823 North 32nd Avenue Stone Park, Illinois

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Tarca Track for overhead material handling

Cleveland Tramrail track dimensions, permitting extension of all systems now in service.

The method of supporting Tarca Tracks, using ball and socket swivel connection both at the ceiling or superstructure and again on the top flange of the track, provides complete flexibility. The flexible suspension helps equalize wheel loads, eliminates bending stresses in the suspension fittings, and of major significance, promotes free rolling of all wheels. Tarca Tracks can be used for either hand-power or electrified installations and may be connected to track switches. Systems can be developed for nearly every handling situation requiring straight or curved tracks for all loads up to 20 tons. Standard Tarca Tracks are available in lengths to 60 feet.

modern machine shop \*

#### NUTRUNNERS AND SCREWDRIVERS

The 21F and 22F Series fastening tools now being marketed by Buckeye Tools Corporation, P. O. Box 966, Dayton 1, Ohio, have 24 different models for air-powered nutrunning and screwdriving, including several

#### MACHINE PRODUCTS PRECISION EQUIPMENT

- INCREASES ACCURACY
- · REDUCES REJECTS
- SPEEDS SETUPS
- · CUTS COSTS

You'll hold closer tolerances and increase efficiency, too, when you use Machine Products precision surfaces. Because the combination of superior materials, skilled craftsmanship and rigid quality controls in the manufacture of Machine Products equipment assures you of the precise dimensional accuracies you require. A complete line of plates and accessories is available, so send for your free catalog today.



MACHINE PRODUCTS CORPORATION
6771 E. McNichols Rd. Detroit 12, Michigan

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MODERN MACHINE SHOP

225

models equipped with a torque control "one shot" clutch. The tools are said to provide a single pulse of torque for better quality control of the fastening operation, longer life for the bit or socket, and less damaged caused by the bit slipping off the fastener and marring the workpiece.

The smallest and lightest tool made by Buckeye has a spring-loaded



View shows Buckeye Fastening Tool with a spring-loaded torque control clutch

torque control clutch. Its torque range (infinitely adjustable) and speed range (500 to 1800 r.p.m.) makes it particularly effective on No. 10 screws

and smaller. Buckeye's lower r.p.m. tools are best suited for applications where torque accuracy takes precedence over speed. The two series offer an extensive product line, with options of reversible (22F) and non - reversible (21F) operation. torque control clutch, positive clutch, and straight drive. pistol grip or lever throttle, and capacities up to No. 10 machine screw. Weights range from about 13/4 to 21/4 lb. and lengths from 8 5/16 inches to 10 13/16 inches.

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m m s

#### LUBRICATOR

A compressed air line lubricator featuring a transparent "sight"



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will pay you big dividends in time, labor

Write Today . . . for your copy of the

new Johnson catalog. All models and

accessories described, illustrated in full.

MANUFACTURING

CORPORATION

smooth production and eliminate scrap.

MODERN MACHINE SHOP 226

September, 1961

dome that lets the user see the changing oil delivery rate as he manually adjusts it has been announced by Hannifin Co., Dept. 166, 501 South Wolf Rd., Des Plaines, Ill. The Hannifin "Sight Feed" Lubricator is offered in  $\frac{1}{4}$ ,  $\frac{3}{8}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$ , and 1 inch pipe sizes for service to 150 p.s.i. It will provide accurate, constant oil delivery in applications that move as little as one to two cubic feet of air per minute. Only

a 0.4 pound pressure drop is needed to start oil feed, making more air power available for useful work. With the "sight feed" feature, different oil rates, from virtually "noflow" to a steady stream, can be seen and judged as the feed is being manually adjusted.

To simplify installation, inlet and outlet ports are interchangeable: just install



Hannifin Feed" Lubricator

the lubricator with the fill plug in the most convenient position, then rotate the "sight" dome 180 degrees and replace it on the lubricator body so arrow points in the direction of the flow. The bowl can be filled quickly through a large opening in the top of the body without shutting down the supply of production air. Also, the bowl can be removed and replaced in seconds without tools.

For more data circle 100 on Postpaid Card

#### FOR THE MECHANIC WHO TAKES PRIDE IN HIS JOB



New Wilson Series 93 air drills are powerful and compact. They have a drilling capacity up to 3/8 in. You have a choice of 7 speeds for efficient drilling of a wide range of materials. Available in straight models with lever or pushbutton throttle and offset grip models with trigger throttle.

All Wilson portable pneumatic production tools are lightweight, compact, designed for easy handling. • Catalog PT-58 gives all the facts. Write for your copy. TW917

THOMAS C. WILSON. INC. 21-11 44th Avenue, Long Island City 1, New York BETTER TOOLS FOR BETTER WORK

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MODERN MACHINE SHOP

227

September, 1961

#### TWO-WAY RELIEVING FIXTURE

A universal two-way relieving fixture for grinding radial relief only, axial relief only, any combination of radial and axial relief, and plain circle grinding has been announced by the Henry P. Boggis Co., 708 East 163rd St., Cleveland 10, Ohio. The Hybco Two-Way Relieving Fixture is available with the Model 1900 Grinding Machine or separately for use on the customer's tool and cutter grinder. The relieving fixture can be furnished with swivel index base, rectangular base, or extended base with outboard bearing and tailstock. The fixture can be motorized or hand operated.

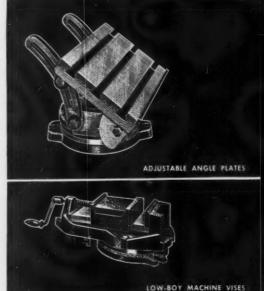
According to the manufacturer, the Hybco Universal Two-Way Relieving Fixture provides high accuracy tool sharpening at low cost with increased tool life. Typical tools that can be sharpened are: dovetail milling cut-

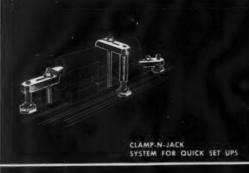


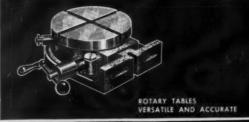
View of Boggis Two-Way Relieving Fixture

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Beals, McCarthy & Rogers, Inc., Buffalo TL 4-4900 Machinists' Tools, Inc., Buffalo TT 4-5397 Gierston Tool Co., Elmira RE 3-7191 Oakland Supply Corp., Hempstead [L.1.] IV 9-0511 Gierston Tool Co., Jamestown Lakeland Machine Tool Corp. Peekskill PE 7-2838 Electra Industrial Dist. Inc., Poughkeepsie GL 2-9000

Steeves Machine Tool Sales Rochester HU 2-0600 Clark Witbeck Co., Schenectady FR 4-4161 A. V. Wiggins Co., Syracuse GR 1-9141

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## UNIVERSAL

RA 7281

VISE & TOOL CO.

DADNA - MICHIGAI





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230 MODERN MACHINE SHOP

ters, center drills, end forming tools, center reamers, die sinking tools, step drills, stub reamers, two-flute milling cutters and other circular tools with evenly spaced flutes. Setup is quickly accomplished by using dial indicators to preset the amount of relief required. The intersection of diameters and shoulders is not undercut. Cams mounted on the fixture spindle are easily and quickly changed and can be reversed for left hand tools. For more data circle 101 on Postpaid Card

\* modern machine shop

#### TOOL CARRIER

Bay Products Div., American Metal Works, Inc., 1827 West Cambria St., Philadelphia, Pa., has announced a heavy duty tool carrier which has been designed especially for storage of the cumbersome tools and equipment necessary to set up and maintain



Bay Four Drawer Industrial Tool Carrier

September, 1961

modern production machinery. Each of the four drawers is a generous 15 by  $23\frac{1}{2}$  by  $4\frac{3}{4}$  inches and can be padlocked individually. The entire cabinet can be moved easily on its  $2\frac{1}{2}$  inch diameter caster wheels where the same equipment is required for more than one machine. The cabinet is 18 by 24 by 34 inches high and finished in forest green baked enamel. Other one, two, and three drawer models are also available.

For more data circle 102 on Postpaid Card

\* modern machine shop

#### MAGNET CHUCK

Brown & Sharpe Mfg. Co., Industrial Products Div., Providence 1, R. I., has announced a 6 by 18 "Micro-Mesh" Permanent Magnet Chuck which has a close-spaced pole arrangement utilizing barium-ferrite (ceramic-type) magnets and is said to permit machining of small, thin work (from 0.001 inch). Thickness gage stock 21/2 inches long by 3/8 inch wide was ground to 0.0008 inch thickness on a surface grinder with 1/8 inch of the wheel cutting 0.0001 inch per pass. Sliding tests on the "Micro-Mesh" Chuck show a holding power of two-and-onehalf pounds per square inch for a piece



B & S "Micro-Mesh" Permanent Magnet Chuck

September, 1961



## balance ROTATING PARTS faster...

Supersensitive Anderson Balancing Ways (Stand or Pillow Block Type) will static-balance rotating parts easier, faster, more accurately. No setup, no leveling, no centering. Glass-hard spindles and bearings prevent wear or ball-bearing indentations when balancing heavy work. Superior accuracy lasts throughout long life. Proved and preferred over 40 years.

## Anderson

### HAND SCRAPERS

Anderson Hand Scrapers are: (1) faster cutting, (2) easier to use, (3) just the right spring, (4) palm fitting grip, (5) 18" - 20" - 22" lengths. Saves costly regrinding.

\$6.75 (18") with high speed blades

\$9.85 (18") with carbidetipped blades

\$1.75 for rubber bumper shown below



Write for Bulletin 9-22 ANDERSON BROS. MFG. CO.

Rockford, III. For more data circle 478 on Postpaid Card

MODERN MACHINE SHOP

231



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POWER FEED FOR SPEED -**EXCELLENT LOW COST UNITS FOR-**BRIDGEPORT (BOTH LONG & CROSS) U. S. BURKE "MILLRITE" GORTON "MASTERMIL" 1-22 **ROCKFORD MV 100** HANCHETT "MAG MILL" CLAUSING & OTHER POPULAR MILLING MACHINES



ALSO RAPID TRAVERSE UNIT FOR \$8750 BRIDGEPORT, GORTON & OTHERS

35 LBS. WITH COLLET RACK



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#### new equipment . . .

0.008 inch thick, the company states. Because holding power over the entire magnetic surface is uniform, Brown & Sharpe's "Micro-Mesh" Chuck can be used fully loaded for maximum production. The handle shaft support mechanism is located on the chuck exterior. Overall width including lever is maintained at 9 1/16 inches. The 618-4 "Micro-Mesh" Chuck also provides long-sought holding power in toolroom and inspection applications. The "Micro-Mesh" Chuck has 6 by 18 inch working surfaces; 6 by 153/4 inch magnetic surface and 6 by 18 inch base dimensions. The height is 21/2 inches and length with

For more data circle 103 on Postpaid Card

modern machine shop

lever "on" is 22 7/16 inches.

#### AIR GAGES

Standard Gage Co., Poughkeepsie, N. Y., has announced a complete selection of adjustable, manual air gages. Designs which have been proven in actual use for as many as 20 years, are now adapted to air. They include Standard's Bore Gages, available in seven sets to cover i.d.s from 0.123 inch to 24 inches: twelve adjustable Airsnaps cover all o.d.s from 0 inch to 12 inches.

Other adjustable manual gages cover



Standard Gage Adjustable Manual Air Gages

such types as shallow diameter gages, p.d. comparators and regular bench type comparators.

For more data circle 104 on Postpaid Card

\* modern machine shop \*

#### CARBIDE TIPPED KNIVES

O-Kni-Co Tungsten Carbide Tipped Knives, manufactured by The Ohio Knife Co., Cincinnati 23, Ohio, are ideal for all types of high produc-

tion applications. Used in high speed cutting, shearing and granulating, the knives effectively resist a high degree of abrasion and maintain cutting accuracy over long runs.

O - Kni - Co
Tungsten Carbide
Tipped Knives
are used on all
classes of iron,
steel and nonferrous alloys. In
addition they are
widely used in
high production
operations such
as slicing thin
sheets of plastics,
formica, rubber
synthetics and



O-Kni-Co Tungsten Carbide Tipped Knives

other non-metallics. This type of work requires absolute accuracy to cut to extremely close tolerances. The tungsten carbide tips of these knives are firmly bonded to appropriate backing materials.

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\* modern machine shop

#### **BORING BARS**

A second series of small boring bars with solid Kennametal shanks has



"We use B&W flat drills for one-operation inside forming, because they cut fast and do not choke. We sharpen them ourselves without changing the form or dimensions—they are removed and replaced in holders WITHOUT CHANGING THE SET-UP—and we get long runs between grinds.

"We internal-form compression fitting 'A' and brass bonnet 'B' much faster with B&W form relief cutters than with tooling formerly used.

"The economy of B&W flat drills was proven in our plant over six years ago and we use them for every application possible." Brass-Craft, Detroit.

Send your blueprints for prompt quotations to

#### BEW PRECISION PRODUCTS CO.

Eng. Dept. M P. O. Box 3865, Detroit 5, Mich.

been announced by Kennametal Inc., 1 Lloyd Ave., Latrobe, Pa. The five BB-7500 K-bars have the same diameters, but are shorter in length than the series BB-7000 K-bars.

BB-7500 K-bars are intended primarily for jig boring machines and similar applications where the utmost rigidity is required for close tolerance boring and best possible finish. The



View of Kennametal Series BB-7500 K-Bars

solid Kennametal shank practically eliminates chatter and greatly reduces deflection and vibration.

Standard Kendex positive rake triangular inserts of the screw on type are used on all of these K-bars. The

1. Tool used to

face work

five bar diameters for the BB-7500 series are 3/8, 1/2, 5/8, 3/4, and 1 inch with respective lengths of 4, 5, 6, 7, and 9 inches. The BB-7000 series are made in the same diameters but are 6, 8, 10 and 12 inches long.

For more data circle 106 on Postpaid Card mm s

#### TRAVERSE INDICATOR

Southwestern Industries. Inc., 5880 Centinela Ave., Los Angeles 45, Calif... has introduced an improved Trav-A-Dial Indicator which provides a continuous indication of carriage. slide or tool position in relation to workpiece within 0.001 inch. The Trav - A - Dial can be attached to any machine tool with a special springloaded mount

## Re-Indexing Accuracy Guaranteed!

Put an Enco Turret on your lathe and get the accuracy, speed, and cost-cutting Makes 1 tool do the work of 3 advantages that make Enco Turrets first choice of leading lathe builders. Get 12 station indexing—30°, 60°, and 90° from each of 4 tools . . . get smooth, effortless hand indexing . . . and capitalize on the advantages of Enco's exclusive, patented "O" Ring Seal that keeps indexing mechanism free of chips and dirt. There's an Enco Turret made to fit your lathe.

TOOL BLOCK SPECIFICATIONS	F.O.B. CHICAGO	12
(STANDARD)		2. Same to used to ta
21/2" sq. x 11/4" thick	\$ 39.00	- H - a 1" de
31/2" sq. x 11/4" thick	\$ 61.00	broad-fa
31/2" sq. x 21/4" thick	\$ 76.00	C C
41/2" sq. x 21/4" thick	\$ 83.00	
41/2" sq. x 21/4" thick	\$102.00 2	
6" sq. x 31/4" thick	\$175.00	
(HEAVY-DUTY)		
41/2" sq. x 3" thick	\$155.00	3. Same tool used for
61/2" sq. x 31/4" thick	\$225.00	inside chamfe
7" sq. x 41/4" thick	\$265.00	12 0
71/2" sq. x 41/4" thick	\$305.00	100
	\$\frac{\text{sq. x 1\%" thick}}{\text{sq. x 1\%" thick}}\$\frac{3\\%'' \text{sq. x 1\%" thick}}{\text{sq. x 2\%'' thick}}\$\frac{4\\%'' \text{sq. x 2\%'' thick}}{\text{sq. x 2\%'' thick}}\$\frac{4\\%'' \text{sq. x 2\%'' thick}}{\text{sq. x 2\%'' thick}}\$\frac{6" \text{sq. x 2\%'' thick}}{\text{sq. x 3\%'' thick}}\$\frac{(\text{HEAVY-DUTY})}{\text{sq. x 3\%'' thick}}\$\frac{6\\%'' \text{sq. x 3\%'' thick}}{\text{row}}\$\frac{6\\%'' \text{sq. x 3\%'' thick}}{\text{row}}\$\frac{7" \text{sq. x 4\%'' thick}}{\text{row}}\$\frac{7" \text{sq. x 4\%'' thick}}{\text{row}}\$\frac{1}{	SPECIFICATIONS   F.O.B. CHICAGO

To order Turret fitted to your lathe, send T-Slot, center height dimensions and maximum tool size. No charge for fitting. Fast Delivery.

Write for catalog #61 and name of nearest dealer

ANUFACTURING CO. 4520 W. Fullerton Ave., Chicago 39, III. For more data circle 482 on Postpaid Card

and a fabricated bracket. Measurements are made by a gage wheel contacting a way or machined surface. Motion is transmitted through two precision gear trains to a dial indicator reading in thousandths which is equipped with a bezel for instant zero adjustment. A dial knob, graduated in inches and 1/10 inches, gives a continuous motion record up to 6 inches of travel, repeating thereafter on any

length of traverse. The dial contains a built-in slip clutch which permits full zeroing adjustments without disengaging the gage wheel from its contact surface.

Improvements in the Trav-A-Dial include a new gage wheel, hardened and precision ground from the shaft axis to insure perfect concentricity; two separate gear trains spring-loaded against one another to remove back-



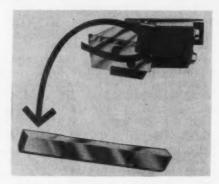
For more data circle 483 on Postpaid Card

lash; miniaturized ball-bearings on gear shafts with tapered shaft ends for take-up; an improved, sturdier chrome plated case made in two halves and equipped with a felt wiper which insures greater freedom from chips in critical areas. The mount has also been redesigned to apply a gradual and uniform spring load between gage wheel and contact surface. It is said to eliminate accidental damage to gage wheel, shaft and bearings through sudden, jarring load applications.



#### CUTTING INSERT

Portage Double Quick, Inc., 1041 Sweitzer Ave., Akron 11, Ohio, has announced a "Manchester" high-speed steel, double-end cutting insert. In addition to utilizing both ends for cut-



P.D.Q. Manchester Double-End Cutting Insert

ting, it is completely preground and ready to use. Back taper, front and side clearance are pre-ground at both ends. The center section of the insert is relieved to insure clearance regardless of depth of cut. The inserts are T-15 high speed steel and offer the highest surface feeds possible, depend-

#### make hundreds of bends

(simple-tough-complex★) with a

### HOSSFELD UNIVERSAL®

The versatile Hossfeld Universal Bender makes hundreds of bends in round, flat or square bar stock, angle iron, pipe, tubing and conduit. It's invaluable for maintenance, limited production work.



Over 150 Standard Dies

are available to reproduce any everyday bend. This versatile Hossfeld bender sets up quickly and is wrenchless for ready use.

3 MODELS: Hossfeld No. 1 for light shop work, No. 2 for heavier work, No. 2 with hydraulic attachment for tough hard-to-pull bends on heavy material.

FREE BULLETIN HOSSFELD MFG. CO.

WRITE TODAY: 404 WEST 3RD STREET, WINONA, MINNESOTA
For more data circle 484 on Postpaid Card

TUBING PIPE

ANGLE

FLATS

ROUNDS



ing on the material being cut-off.

Inserts are standard size: ½8, 3/16 and ¼ inch wide; 5% to 2 inch depth. Inserts for a deeper cut than 2 inches are available as specials. The inserts are interchangeable on all "Manchester" cut-off tools. When used with the "Manchester" rake angle tool, top rake grinding for angle clearance is eliminated. The complete line of P.D.Q. cut-off tools, carbide and hi-speed steel inserts, are available for all makes of turret lathes, production lathes, automatics and cut-off machines.

For more data circle 108 on Postpaid Card

\* modern machine shop

#### SHORT RANGE TEST FIXTURE

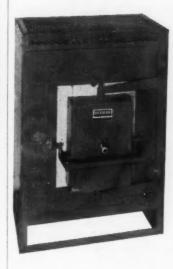
For precise and efficient inspection of survey-type optical instruments such as theodolites, transits, levels and jig transits, Engis Equipment Co., 431 South Dearborn St., Chicago 5, Ill., has developed a Universal Short Range Test Fixture. The fixture construction permits rapid calibration of line-of-sight type optical instruments within the limited space of an ordinary inspection laboratory or gage shop.

The principle involved is one of



Engis Universal Short Range Test Fixture

September, 1961



Fifteen horizontal tube, vertical tube or box-type high temperature furnaces are now produced by Lucifer Furnaces, Inc. The furnaces are designed to incorporate elements that attain temperatures to 3090°F. without protective atmosphere. Element resistance does not change with use, permitting the connection of new and old elements without detrimental effect. Of course all Lucifer furnaces are complete units . . . no extras to buy just connect to power supply. For more information about the high temperature furnaces, our complete line, or free engineering

#### LUCIFER FURNACES, INC.

Neshaminy 6, Pennsylvania

Diamond 3-0411

advice, call on . . .

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MODERN MACHINE SHOP 237

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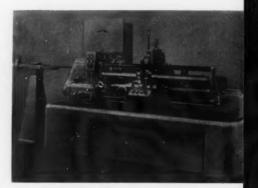
auto-collimation, using ingeniously arranged mirrors and accessory devices; thus accuracy checks which ordinarily require extended sighting ranges are performed within arm's length.

For more data circle 109 on Postpaid Card

modern machine shop

#### CENTERLESS TURNING MACHINE

Contour turning of round, square and hexagon bar stock is said to be done easier and faster on a "Trace-O-Matic" Centerless Shaft Turning Machine now being marketed by Taber Instrument Corp., 111 Goundry St., N. Tonawanda, N. Y. Embodying an entirely new concept of tracer turning. the Taber "Trace-O-Matic" features a rotating bar stock support that is adjacent to, and travels with, the turning tool. Because of the proximity of



Taber "Trace-O-Matic" Turning Machine

the bar stock collet support to the turning tool throughout the entire turning operation, all need for the tailstock center is eliminated. The rotating collet, tool and template follower assembly, and template back-up rolller are contained in one casting mounted on the carriage. The extreme

## BRINEY invites your inquiry-

for precision tools requiring split-tenth adjustments without loosening or tightening screws

> **Precision Boring and Turning Tools** Stocked standards and specials

Diamond Dressing Arm Another special application using the Briney Principle of Precision Adjustment

and Anti-Friction Support and Pilot Bearings Stocked standards and specials

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rigidity of this combination allows higher surface speeds and feeds while maintaining close tolerances with extremely fine finishes.

Bar stock lengths up to 40 inches can be machined in one pass on the Taber "Trace-O-Matic." If the finished parts are sufficiently short, two or more parts can be produced in one pass from duplicate or dissimilar templatees placed end to end. With almost fully automatic operation and simplified push-button controls, an operator can frequently handle more than one machine.

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\* modern machine shop

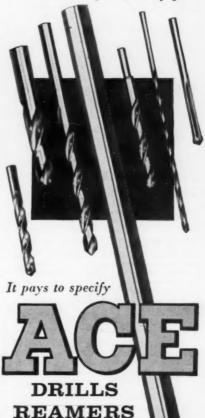
#### STOCK REELS

Cooper Weymouth, Inc., 600 Honeyspot Road, Stratford, Conn., has announced the No. 1200 Series Stock Reels which are designed to handle coil stock that comes within an intermediate weight range up to 1200 pounds. The automatic centering spindle reel supplies a free loop of stock to stamping presses and other units.



Cooper Weymouth No. 1200 Series Stock Reel

Toughest, hardest, strongest ... none finer at any price!



Premium Quality High Speed Steel
Carbide Tipped and Solid Carbide

BLANKS

Call your local distributor today—or write Ace direct for latest catalog and price information.



ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS
For more data circle 487 on Postpaid Card

September, 1961

MODERN MACHINE SHOP

239

## I.ASSY Rapid LOX

#### INSTANT ACTION—"THRED LOCKED" VISE

Assures Powerful Dependable Clamping With Instant Jaw Positioning,



Patented

- . Jaw Pressure Is Selective and Repetitive.
- Ideal for Milling, Drilling, Grinding and Jig Boring—of One Piece or Thousands.

Order from Your Industrial Supplier Mfg: Lassy Tool Co., Plainville, Conn.

For more data circle 488 on Postpaid Card



#### GEAR RACK

Can cut from almost any size and grade of material in most pitches and lengths. Can match ends for continuous sections.

#### MACHINE KEYS

We can supply a complete line of finished machine keys, including gib head and taper keys, rod keys, round end keys, special keys, etc.

#### WOODRUFF KEYS

Complete stock of standard keys on hand for prompt shipment. Made from open hearth or alloy steel. Uniform tolerances for easy, fast assembly.

#### TAPER PINS

Available from stock in sizes 7/0 through 10 and lengths from  $\frac{3}{4}$  inch to 6 inches. Others made to specifications.

## STANDARD STEEL SPECIALTY CO. BEAVER FALLS PENNSYLVANIA Plents: Beaver Falls, Pa.; Hammend, Ind.

For more data circle 489 on Postpaid Card

new equipment . . .

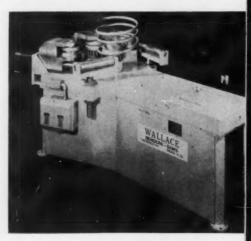
Two models are available, plain and motorized. Both take stock widths to 18 inches, with an o.d. coil of 48 inches and have a weight capacity to 1200 pounds. Three support arms, that feature snap-on keepers, automatically cented the stock coils. The arms are of the parallel rule type, adjustable from the front of the reel. Disc type drag brakes are standard on all models. Rotating parts are ball bearing equipped for smooth, easy action that maintains an even flow of material to the press. Reels are of rugged construction throughout with heavy cast iron bases and pedestals. Both plain and motorized types can be tilted to a 45 degree angle for easy loading of stock.

For more data circle 111 on Postpaid Card

\* modern machine shop

#### ROLLING MACHINES

Wallace Supplies Mfg. Co., 1800 West Cornelia Ave., Chicago 13, Ill., has introduced the No. 460 Series



Wallace No. 460 Series Rolling Machine

Rolling Machines which can be operated either right or left and are capable of doing all kinds of pipe, tube, round bar, square bar and flat bar bending. Tight coils, loose coils, flat spiral coils, wide radius bends or short radius bends all can be made on these machines.

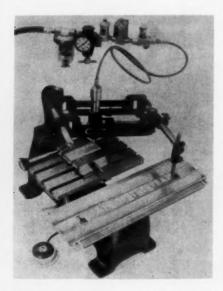
The rolling machines are offered in 3 sizes, designated as the No. 462, 464, and 466 for 2 inch, 4 inch and 6 inch pipe respectively.

For more data circle 112 on Postpaid Card

★ modern machine shop

### ENGRAVER WITH PNEUMATIC DEPTH CONTROL

H. P. Preis Engraving Machine Co., 249 Industrial Branch, U. S. Highway 22, Hillside, N. J., has announced a panto-engraver with a pneumatic attachment for diamond drag marking, identified as the Model UM-PC. Diamond drag marking is said to be the most economical method of panto-



Panto-Engraver with pneumatic depth control



# GREIST - H.B. MICRO-HEIGHT° GAGES FOR FAST MEASURING, LAYOUT AND INSPECTION

Easy-to-read micrometer gage scribes like a vernier height gage. Measures up to 11" with risers, with accuracy of ± .0005". Machine cut gradations in .100" on barrel, .001" on head. Dial indicator attaches for quick measuring between holes and surfaces. All working parts are hardened and ground, adjustable for wear. Glare-free satin-chrome finish. Comes complete with carbide scriber, indicator holder and case.

Micro-Height "2." Reads
directly from 0 to 3"........\$53.00
Micro-Height "4." Reads
directly from 0 to 5".......\$73.50
Immediate delivery from stock. Write for name of your nearest dealer.

# TOOLS

2 COMMERCE ST. CHATHAM NEW JERSEY MERCURY 5-7787

For more data circle 490 on Postpaid Card

MODERN MACHINE SHOP

24

September, 1961

graphically marking on hardened steel, tungsten carbide and all non-ferrous metals. It is ideal for marking sizes, serial, part or code numbers on machine, automotive, or aircraft engine parts.

With the pneumatic attachment, depth or width of cut is controlled by the air pressure selected on the pressure dial which has a range from 0 to

60 lb. Controlled air pressure assures even depth of cut throughout, since it is not subject to variations of hand pressure. The air cylinder on the marking spindle is actuated by a micro switch which is suitable for foot or fingertip control.

For more data circle 113 on Postpaid Card

modern machine shop

TAPE PROGRAMMER

A completely independent programmer to prepare conventional 1 inch wide 8 channel tapes for drilling printed circuit boards directly from art has been developed by Edlund Machinery Co., Dept. P. Cortland, N. Y. According to the manufacturer this is a high speed, highly accurate programmer which can be used with any conventional tape controlled printed circuit driller. The machine enables the operator to work quickly and accurately, locating up to 30 positions per minute directly from the art work; this eliminates the time consuming and expensive job of dimensioning co-ordinate positions, preparing special templates or master boards. Since the programmer is independent of the drilling equipment, it can be used for preparing tapes during the time that the drilling machine is being used to drill printed circuit boards thereby saving time and increasing efficiency.

The machine is said to be highly accurate, correcting errors in the art work and making it easy to find the



you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 8 sizes, from 3/4" to 3/4" U. S. S. Inexpensive-Last years.

Write for Circular NIELSEN TOOL & DIE COMPANY

17336 Lahser Road Near Grand River Detroit 19, Michigan

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242





PRO-TECTO-HED Chisels & Punches

Write for Ø PRO TECTO HED FREE Catalog

THE CINCINNATI TOOL CO. 1947 WAVERLY AVE., CINCINNATI 12, OHIO

For more data circle 493 on Postpaid Card

September, 1961



Edlund Independent Tape Programmer

"true" or desired grid positions. Once a grid system has been chosen, errors or deviations from the desired grid position in the art work are corrected mechanically, and the programming process is kept on the selected grid system automatically. A positive hole indicating device and an automatic safety control insure accuracy and reliability. The hole indicating device shows the holes that have been located so that the operator may check to determine that no skips have been made. The safety control device keeps the cycle initiating push button depressed until the punching cycles is completed, preventing the operator from initiating a cycle that has already been recorded and punched.

The programmer is said to be highly versatile, covering an area of 24 by 24 inches and handling virtually all grid sizes with the use of interchangeable slides arranged for 0.1 inch, 0.05 inch or 0.025 inch grids and art scales of 1:1, 2:1, and 4:1. Odd size grids such

## NUMBERALL

#### Numbering and Lettering Press Mono Wheel Automatic Spacer

Designed for the purpose of impressing Letters and Numbers in all kinds of Name Plates and Flat Metal Parts. The Dials  $3\frac{3}{4}$ " Diameter are made of Special High Grade Tool Steel, scientifically hardened and tempered. The Characters are carefully engraved and make clear cut impressions of uniform depth.

Standard Dials are engraved with 40 characters. Character Heights as follows: 1/16, 3/32, 1/8, 5/32, 3/16". Different size Dials are interchangeable. Carriage Table advances one space with each impression of the Dial, like a typewriter, doing rapid work, even spacing and perfect alignment.

Plates up to 5" wide and 6" long can be stamped, but can furnish a longer Table and Rack if required. Depth of impressions is adjustable by a screw on bottom of machine. A direct sight gauge is provided, to facilitate stamping in the proper place. We can also make steel type with round face characters.

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.



on request. Model No. 40B

For more data circle 494 on Postpaid Card

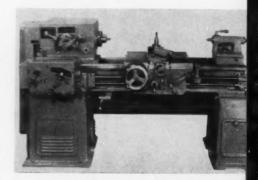
as 0.14 inch and grids that vary from the "X" to "Y" axis are also handled easily.

For more data circle 114 on Postpaid Card

★ modern machine shop ★

#### GEARED HEADSTOCK LATHE

The C&J Master Model GH 16 and 18 inch Lathes, manufactured by the Carroll-Jamieson Machine Tool Company, Dept. 9, Batavia, Ohio, feature "Twin-Disc" friction clutch and friction-type brake which provide spindle control without the necessity for stopping or starting the motor. In addition, extra heavy gearing in the headstock provides maximum power at the spindle, making the lathe capable of rugged turning operations. The company states, as a result of these fea-



C & J 16 Inch Master Model GH Lathe

tures, the lathe offers greater ease of operation, increased productivity, and reduced turning costs.

The clutch and brake assembly is actuated by a control handle at the front of the lathe. Two shifter handles provide a quick, convenient method

### People work better when they SEE BETTER®



HUGHES AIRCRAFT CO. Research and Development Lab. uses MAGNI-FOCUSER for closer visual inspection of high precision gauges.

GNI-FOCUSER

For increased production, greater accuracy, fewer accidents and errors, use the MAGNI-FOCUSER—the new 3-D binocular magnifier with matched prismatic lenses. It provides needlesharp vision — greatly magnified and in third dimension.

Scores of industrial jobs are being aided by the MÄGNI-FOCUSER. It reduces eye strain and avoids squinting; leaves both hands free to work. It's light weight; can be worn with or without eye glasses; normal vision resumed simply by raising the head.

Speed your production by ordering now on 10-day trial basis without obligation. Only \$12.50. Immediate delivery. Or write for illustrated folder.

the 3-D Magnifier that speeds production and leaves both hands free to work

EDROY PRODUCTS CO., Dept. P, 480 Lexington Ave., New York 17, N. Y.

For more data circle 495 on Postpaid Card

of spindle speed change. Twelve geared spindle speeds from 20-900 r.p.m. are obtained through shifting the cluster assembly and clutch gearing.

Power for the C&J Lathe is applied through a triple vee-belt pulley on the drive shaft. The 5 h.p. motor provided with this arrangement transmits full power required, quietly and smoothly. Heat treated alloy steel spur tooth type gears are employed, ranging from 3/4 to 11/8 inch face. The headstock

also has the capability for fine finish turning in the highest geared range. The headstock is totally enclosed, with all gearing functioning in oil. All bearings are automatically lubricated. The lathe can be furnished with center distances up to 156 inches. For more data circle 115 on Postpaid Card

#### SAW GUIDE

A band saw guide, the Guidall Sr. 600 has been introduced by the

m m s

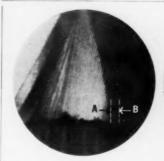


Carter Guidall Sr. 600

Carter Products Co., Inc., 50 Market Ave., Northwest, Grand Rapids, Mich.

The Guidall Sr. 600 features a ball bearing thrust wheel and support wheels, all on eccentric adjusting studs. The Guidall Sr. 600 is ideal for loads of 75 to 80 pound thrust at speeds ranging up to 10,000 feet per minute on saws with blades 3/16 to 11/2 inches wide, according to the manufacturer.

For more data circle 116 on Postpaid Card



Excessive runout of end mill turning in average adapter shows up as variation in position of one flute (A) and others (B), in photograph.



B&S adapter turns same end mill with much less runout, as indicated by almost exact coincidence of one flute (A) and others (B).

#### "Stop-Action" Camera shows why B&S Adapters give you longer cutter life

Less runout means less "wear out!"

That's why your cutters last longer, when held in B&S adapters, than when held in other brands.

Brown & Sharpe guarantees low runout within .0005", at the adapter mouth -.0015", 6" out.

Send for new B&S Catalog Supplement

37A, showing cutter-saving, work-saving adapters, 76 brand new items listed. Brown & Sharpe Mfg. Co., Providence 1, R. I.



For more data circle 496 on Postpaid Card

September, 1961

MODERN MACHINE SHOP

245

#### MICROSCOPE

Opto-Metric Tools, Inc., 137 Varick St., New York 13, N. Y., has added to its Leitz line a toolmaker microscope, which combines an increased range of 3 by 8 inches, a purely optical measuring stage and a binocular microscope tube. As a unique innovation it incorporates 3 by 8 inch master scales that are read directly in 0.0001 inch through a single projection window. These scales make the measuring operation in both directions fully continuous and extremely simple, since no gage block dimensions have to be added to or subtracted from the scale readings.

An even more important innovation is represented by the binocular intermediate image tube, which retains the 1:1 relay system of the standard Leitz Tube, plus a second relay ratio of 5:1. With the same optics, two series of



View shows Model Leitz Toolmaker Microscope

magnifications become available as 10x, 20x and 30x as well as 50x, 100x and 150x. For the ever widening need



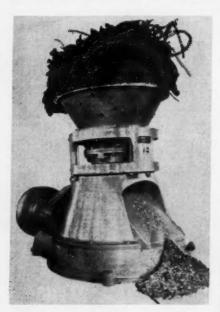
for critical measurements by the miniaturization program the second series of higher magnifications should be most welcome. In addition to the greater convenience of binocular observation the tube features I:1 thread and radii charts, internal protractor reading in one minute and a doubleimage adapter in complementary colors for checking center distances of holes.

For more data circle 117 on Postpaid Card

\* modern machine shop

#### CHIP CRUSHER

Homestrand Machine Tool Corp., 392 West Putnam Ave., Greenwich, Conn., has announced the Arboga Chip Crusher. The unit features automatic reversing when jammed by overloading and therefore operates with a minimum of supervision. Capacities up to ten tons per hour are available. For more data circle 118 on Postpaid Card



View of Homestrand Arboga Chip Crusher

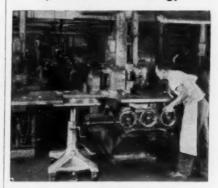
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PORTABLE

**ELEVATING TABLE** 

YOU CAN BUY . . .

(Eliminates Cranking)



2000\* LBS. OR 1000 LBS. CAPACITIES \*ILLUSTRATED

### A precision made MIDWEST TABLE Costs no more!

- It's hydraulic . . . positions work or feeds at desired height without use of hands
- Rigid cast construction
- ✓ Top turns 360° and clamps
- Foot releases valve to lower
- Machined top surface can be used as work table.
- Roller bearing casters with ball bearing swivels
- Floor clamping available extra

Write today . . . specials on request

MIDWEST

114 WEBSTER ST. • DAYTON 2, OHIO For more data circle 498 on Postpaid Card

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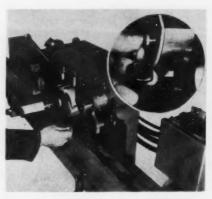
September, 1961

#### OFFSET PRINTER

James H. Matthews & Co., 3962 Forbes Ave., Pittsburgh 13, Pa., has announced a new unit in its line of offset printing machines. Designated Model 6519, it can be installed over present conveyor lines or it can be used with dial feed tables, and other parts handling systems, for automatic marking of capacitors, resistors, and other small rectangular or cylindrical parts, as small as 3/16 by ½ inch.

Ruggedly constructed, the unit is said to meet minimum or maximum line speeds with consistent high quality printing. The offset method provides fast, legible printing of parts with flat or uneven contours. Each unit is equipped with paste type ink fountain, adjustable doctor blade and steel dip type ink roll.

Printing is done with rubber print-



Matthews Model 6519 In-Line Offset Printer

ing dies mounted on a segment roll, which prints on rubber segment pad, which in turn offset prints on the part. The die roll and blanket roll have micrometer adjustment for precision control of printing.

For more data circle 119 on Postpaid Card

FOR INDEXING VERSATILITY



Versatile: 3 sizes — 8", 12", 24" diam.

Mount your own fixtures or any type of chuck

Rugged — Accurate

Write for bulletin and prices on this all 'round shop aid.

The Hartford Special Machinery Co. 3700 College Highway Simsbury, Connecticut



For more data circle 499 on Postpaid Card

### FEED FOR DEEP HOLE DRILLING

A reciprocating feed arrangement, available as optional equipment for deep hole drilling on all Burgmaster Automatic Bench Model Turret Drilling Machines, is another feature added to the bench model line, according to the manufacturer, Small Tool Div., Burgmaster Corp., 15001 South Figueroa St., Gardena, Calif. The feed arrangement permits drilling to a cer-

tain depth; retracting to the top of the workpiece; rapid traversing down to the previous stopping point of the drill; drilling another increment (as desired); retracting to the top of the work to clear chips; and then repeating the cycle until final depth is reached. At this point, the drill is rapidly traversed to the top of the stroke, indexed to the next tool and continues the machining cycle.

Depth setting and rapid traverse are set on an electronic device to control the depth for each stroke and withdraw the drill any number of times to suit the work involved. The company states, extremely small holes can be drilled with the Burgmaster

### CHICAGO° PRESS BRAKES

UNEXCELLED ACCURACY





Automatic Bench Drilling Machine with air power feed and automatic cycling

Press Brakes
Press Brake Dies
Straight-Side-Type Presses
Hand and Power Bending Brakes
Special Forming Machines



DREIS & KRUMP
MANUFACTURING CO.

7418 S. Leemis Blvd., Chicage 36, Illinois For more data circle 500 on Postpaid Card

Reciprocating Feed Attachment, which also permits a range of speeds from 350 to 21,000 r.p.m.

For more data circle 120 on Postpaid Card



Just slip a tap adaptor into the Dahlstrom Tap Guide and Twist. Your hand tapping will be quick and accurate. For machine tapping, the spindle top is center-bored to fit the tail stock center of a lathe. Size 18" x 8" x 14". Included 9 adaptors (8-32 to 3/4"). Taps not furnished. Write for pamphlet on Tap Guides, Chucks and Autostops.

BRANCH MFG. CO., 15 Olson Drive, North Branch, Minn.

### Dahlstrom TAP GUIDE

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### **PUNCHES AND DIES**

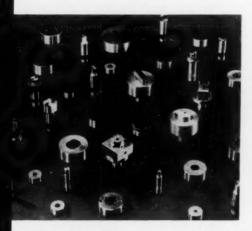
An expanded line of special purpose punches and dies for electrical and electronic punching in over 110 sizes has been announced by Di-Acro Corporation, 758 Eighth Ave., Lake City, Minn. Additions to the line of Di-Acro Single Station Punches and Dies include D and double D shapes, hexagon cutouts, electrical outlet knockout, keyhole, 7 and 9 pin tube base, receptacle, keyway, tab, trim and cutoff, and corner rounding styles.

Three and four section lytic, I. F. condenser, and cable opening punches and dies are also available but require special quotation because diameter of punch and die shank must be specified in advance. Di-Acro Punches and Dies are also available in round, square, rectangular and oval styles in over

500 sizes.

Cutting edge of the Di-Acro Punch and Die is ground with a high degree of concentricity. The punch point is concentric to the shank within 0.0005 inch. The user can purchase either the individual punch or die instead of a complete set in the event replacement of only one is necessary. Setup time and precision layout work time is said to be also saved because the concentric ground centering point enables accurate alignment of holes when





View shows Di-Acro Punches and Dies for use in electrical and electronic work

using punches ½ inch and up. Punches 13/16 inch and larger, round or equivalent irregular sizes requiring more than four tons to punch 16 gauge mild

steel, are ground with a twin shear reducing necessary power approximately 50 percent. Punches 13/16 inch or larger can also be supplied without the twin shear for blanking. Adapters are available enabling DiAcro Punch and Die Sets to be used on all hand and power operated punch presses.

For more data circle 121 on Postpaid Card

\* modern machine shop

### SPRING LOOPER

A modular spring looper has been designed by The Torrington Manufacturing Co., Torrington, Conn., as a semi-automatic or automatic high-speed machine for either independent operation or in combination with any standard spring coiling machine. While the appearance of the looper is unique, its looping tools are familiar to all toolmakers and set-up men. The looping tools and tool-adaptor assem-



### **BAND SAWS**

STOCKED BY DISTRIBUTORS
FOR YOU



SAF-T BANDS for jobs that require High Speed alloy bands on special expensive equipment.

VAN KING special alloy BANDS for types of cutting that requires more in value and performance than possible with regular bands.

REGULAR flexible metal cutting BANDS for ordinary cutting.

Hundreds of plants are getting results that SATISFY. Give them a trial today.

Write Today for Hack Saw Bulletin 16. It May Help You.

SPARTAN SAW WORKS . SPRINGFIELD, MASS.

Hack Saws — Band Saws — Hole Saws — Flat Ground Steel — Tool Bits

For more data circle 503 on Postpaid Card

blies, which are easily removed and replaced for different runs without readjustment, substantially reduce setup time and maintenance down-time.

The Torrington Looper can form all standard types of loops on springs with an unusually wide diameter range of from 1/8 to 3/4 inch and body lengths from 5/16 to 5 inches. Wire

### STRIPPER BOLT SHIMS



Shims fit standard bolts and eliminate the need for re-counterboring or turning of bolts to maintain stripper height when sharpening dies. Write for complete details.

ALSCO CO., 81 Rochester St., Lima, N. Y.

For more data circle 504 on Postpaid Card

BORING BAR

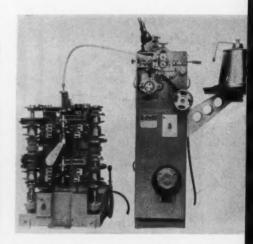
MODERN

VIBRATION. CHATTER!

Scientifically designed to diminish vibration in boring, the MOD-ERN boring bar has various size holes drilled from each end to minimize harmonic vibration. Hole diameters were determined by using a VIBRATION METER and probing bar every 14". The cavity is filled with shock absorbing material under vacuum, thus obtaining a dead bar of superior strength.

MANUFACTURING CO., Inc. 680 Davisville Road, Willow Grove, Pa.

For more data circle 505 on Postpaid Card For more data circle 506 on Postpaid Card



View of Torrington Looper, at left, being fed from a coiler in automatic operation.

capacity ranges from a maximum of 0.072 inch down to approximately 0.010 inch (the smaller the diameter of wire, the greater the skill in set-up required).

The labor saving offered by the Torrington Looper's operation at speeds up to 4200 springs per hour on very small springs is particularly advantageous. The modular design of the Torrington Looper permits the gradual purchase of functional subassemblies as funds become available and as semi-automatic or fully automatic operation is required.

For more data circle 122 on Postpaid Card

### SAVAGE

#### NIBBLING MACHINES

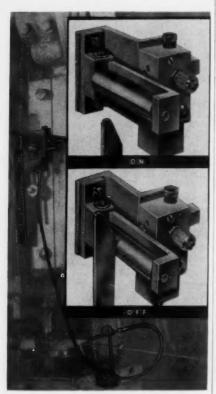
- Sheet Metal Cutters Roller-Die Type Best for
- Cutting Stainless Steel • No Sparks • No Oxidation
- No Secondary Operations
- No Open Flame Capacities to 3/4
- DEALERS IN MAJOR CITIES WRITE FOR BULLETIN "K"

W.J. SAVAGE COMPANY

### STOCK LUBRICATING VALVE

Aetna Mfg. Co., 188 South York Rd., Bensenville, Ill., has introduced a specially designed valve and cam actuation which is said to permit easy installation of automatically applied lubricants for all types of punch press operations. Mistic Mist Generators, for which these valves are designed, operate with shop air lines and pressures and are available in standard units for almost any fabricating procedure.

The cam operated air and oil valve is located on the front of the press, permitting easy access for adjustment of desired mixture. The up and down



Aetna Cam Operated Air and Oil Valves

Reclaim valuable cutting with an OLSON CHIP WRINGER

Olson Chip Wringers are especially designed to reclaim cutting oils and coolants from metal chips and turnings.

Up to 99% of the oil can be removed from the chips for immediate re-use. This savings in oil alone can quickly pay for an Olson Chip Wringer. Oil-free chips will bring you more money, too.

Olson Chip Wringers are ruggedly built to give you many years of trouble-free operation. For complete information, call your nearby Olson distributor, or write for Catalog RC 363-002.

LSON FILTRATION ENGINEERS
5024 Section Avenue, Cincinnati 12, Ohio

For more data circle 507 on Postpaid Card

MODERN MACHINE SHOP 253

stroke of the press ram controls the on and off operation of the valve, which directs lubricants through an extremely small, precise nozzle to the press operation. Applying coolants and cutting fluids automatically prolongs cutting and forming efficiency of the die and permits greater stamping accuracy.

For more data circle 123 on Postpaid Card



For more data circle 508 on Postpaid Card

### Allman Universal Hand Tapper 5 TIMES FASTER

A great time, labor and material saver. Fixture taps five holes to every one using the free hand method. Eliminates costly tap breakage.

#### CHECK THESE FEATURES:

- Articulate arm swings clear of large table for placement of work.
- Limitless number of sizes of tapped holes without moving work piece.
- Vise holds work as small as %"
   square.
- Floating tap locates itself in hole.
- Individual spindle holds taps, thus change requires only seconds.



TOOLS,

1734 No. 25th Ave. • Melrose Park, III.

For more data circle 509 on Postpaid Card

#### HIGH SPEED PRECISION LATHE

An improved model high-speed. precision lathe for toolmaking and precision production, featuring infinitely variable spindle speeds with constant horsepower, has been introduced by the Nebel Machine Tool Corporation, Lathe Div., 3414 Central Parkway, Cincinnati 25, Ohio. The Micro-Turn combines a unique mechanical speed variator drive unit plus exclusive coaxial spindle design to provide an infinite selection of spindle speeds throughout a continuous range from 43 to 3,500 r.p.m. Constant, full drive horsepower is delivered through the entire range, with output speed said to be maintained within twotenths of one percent. Thus, maximum torque is provided at lowest speeds for heavy cutting, plus precision balance and minimum vibration at the high speeds assuring ultra-fine finish. Built-in torque responsive mechanism in the main drive unit is said to prevent slippage under starting or shock loads.

For maximum turning efficiency there are two speed ranges. In the low speed range, up to 400 r.p.m., the Micro-Turn operates through a planetary gear unit. In the high speed range, above 400 r.p.m., headstock coaxial sections lock into a single unit, and the lathe operates without gearing through matched multiple vee-belts directly from main drive to spindle, assuring positive torque and minimum

### GUN DRILLING HYDRAULIC UNIT

Both high and low pressure pumps and tanks; proper G.P.M. for job. Large filter unit, 5 micron. Pushbutton station. Avey Division, Cincinnati 1, Ohio.





For more data circle 510 on Postpaid Card

September, 1961



Nebel Micro-Turn High Speed Precision Lathe

vibration. Shifting between high and low speed ranges can be accomplished while the spindle is rotating or stationary. Actual selection of desired

spindle speed is simply and conveniently achieved through centralized pushbutton controls and direct-reading tachometer. The Micro-Turn's totally enclosed pressure lubricated gear box provides 60 thread and 60 feed changes. The standard thread range from 4 to 240 threads per inch includes standard pipe size threads of 11-1/2 and 27. Standard feeds range from 0.0005 inch to 0.0337 inch per revolution of spindle. An exclusive feed converter, located in the apron, provides simple conversion from standard to optional feed ranges without affecting standard thread changes.

For more data circle 124 on Postpaid Card

★ modern machine shop

#### **COIL SPRINGS**

More than 800 sizes have been added to the line of precision compression and extension coil springs offered by Associated Spring Corp.,



For more data circle 511 on Postpaid Card

September, 1961

MODERN MACHINE SHOP

255

Bristol, Conn. Totaling more than 1500 sizes with the added units, the springs have been designated Standard Precision Engineered Coil (SPEC) springs.

The wide variety of stock A.S.C. SPEC springs includes compression springs in a range of 0.057 inch through 0.720 inch o.d., to fit standard holes, and with wire diameters of



View shows Associated Coil Springs

MAGNETS. VARIOUS SIZES AND TYPES

11 PERMANENT

TOOL MAGNETIC TOOLS HOLDER Indicator Holder — 1/4" dia. non-magnetic stainless steel

MAGNETIC

BASE

rod complete with 5/16" and \%" 0. D. bushings. Fine precision adjustment identical to surface gage, Hardened ball

Model 2008 - \$6.95

socket setting permits universal positioning. Powerful 50-lb. pull magnetic base insures firm grip on any ferrous surfaces, curved or flat. Write for Catalog #958-A CULLEN MFG. CO., INC.

1603 Washington Ave., Racine, Wis.

For more data circle 512 on Postpaid Card

0.006 inch through 0.072 inch. Extension spring diameters range 0.063 inch through 1.0 inch and lengths range to 5 inches.

The newly added compression springs include a complete range of sizes in 0.057 and 0.088 inch o.d. New extension spring sizes have been added in the 0.063, 0.094, 0.180, 0.850, and 1.0 inch o.d. categories.

Like the other coil springs, the new units are available in music wire for standard applications or in stainless steel for applications where temperatures range as high as 250 to 500 degrees F. Both are certified to military and aircraft standards.

All SPEC compression springs are squared and, except for smallest sizes, also are ground. SPEC extension springs are supplied with full twist loop, but special ends are available. For more data circle 125 on Postpaid Card



For more data circle 513 on Postpaid Card MODERN MACHINE SHOP



2361 University Ave., St. Paul 14A, Minn. For more data circle 514 on Postpaid Card

September, 1961

256

#### **CUTTER AND TOOL GRINDER**

Covel Mfg. Co., P. O. Box 116, Benton Harbor, Mich., has introduced the Model 12B Electrolytic Cutter and Tool Grinder which was especially designed to utilize the advantages of the Anocut Electrolytic Power Pack as applied to grinding a variety of carbide cutting tools such as face mills, end mills, counterbores, reamers, single point and so on. The machine's spindle is equipped with brushes and slip ring to carry the current from the power pack through the spindle and to the metal bonded diamond wheel (the minus side). Since the workpiece is the plus side the spindle is insulated from the rest of the machine.

The spindle head is said to tilt 15 degrees each way for quick setting of clearance angles. The work head spindle holds the cutter to be ground and has brushes with slip ring to bring the current (the plus side) to the work. As the spindle has an air operated automatic indexing device it is not necessary for the operator to touch the work or the work head during the grinding. After indexing to the next tooth the spindle rotation is reversed



Covel Model 12B Cutter and Tool Grinder



# FOR HI-SPEED SMALL HOLE DRILLING

### New MICRO FEED and Infinitely Variable Speed Control

Never was it easier to drill extremely small holes profitably on a production basis! 4:1 ratio Planetary Micro-Feed . . . for drills down to .004". Standard Feed for No. 60 to 5/32". Variable speed control 1,000 to 10,000 or 2,500 to 15,000 RPM. Direct Motor Spindle.

Write for Literature and Prices

THE ELECTRO-MECHANO CO.

265 E. Erie Street Milwaukee 2, Wis.

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MODERN MACHINE SHOP

257

September, 1961

Gaertner Optical Instrumentation designed and manufactured in the U.S.A.



## Gaertner 2"x 4" toolmakers' microscope for measurement to 0.0001" and 1 minute of arc

You'll find the Gaertner Toolmakers' Microscope as part of the standard inspection equipment in the ideally-equipped shop or lab. It will do the work of many single-purpose measuring and inspection instruments with greater convenience and accuracy.

Full 2" precision lead screws permit measurements over 2" x 2" of the instrument's range without the use of

gage blocks or rods.

Independent and combined rotation of the cross hairs in the protractor ocular speed up measurements and simplify measuring procedure. The instrument's versatility may be increased through the addition of such accessories as thread and radius templates, camera and spotting attachments, fine motion focus, direct-reading counters, and interchangeable optics for varying magnification and field.

Write for Bulletin 147-56

For more data circle 516 on Postpaid Card

1275 Wrightwood Ave., Chicago 14, III., BU 1-5335

Gaerlner

### new equipment . . .

to bring the cutter against a preset lip rest and hold until the next index. The air operated infeed with hydraulic check provides rapid approach, adjustable feed, and automatic return controlled by micro switch with micrometer setting. The infeed slide is mounted on balls to provide for frictionless movement.

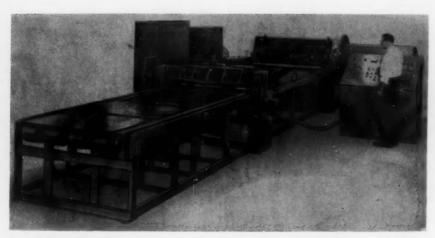
The table, according to the company, has an automatic reciprocating movement with adjustable stroke 0 to ½ inch at a rate of 43 strokes per minute. When plunge grinding, the tool will be moved across the entire wheel face. The table ways are antifriction ball bearing. As this type of grinding requires that an electrolyte to be flowed between the wheel and the work, a system comprising a stainless steel tank, pump, splash guards and drains is supplied. In addition, an exhauster is connected to the wheel hood to create a vacuum at this point so spray from the wheel will be withdrawn from the operating position. A wheel hood consisting of a ring of bristles is used to confine the electrolyte and still allow the cutter to be brought to the wheel. All exposed parts of the machine are plated with a special process to eliminate corrosion by the electrolyte.

For more data circle 126 on Postpaid Card

\* modern machine shop \*

### DECOILING AND CUT-TO-LENGTH LINE

In announcing the Lennox Automatic Decoiling and Cut-to-Length Line, Lennox Tool & Machine Builders, Dept. 339, Lima, Ohio, state that the Lennox Line has been designed to provide highly accurate cut lengths at a low initial cost. The basic Lennox Line consists of a coil reel, a straightener or leveler/measuring unit, a hump table, a shear and a conveyor



Lennox Automatic Decoiling and Cut-To-Length Line. Basic line consists of Coil Reel, Straightener or Leveler/Measuring Unit, Hump Table, Shear and Conveyor Unit

unit. Various capacity lines are available, with a maximum sheet thickness of 3/16 inch and 72 inches in width.

Cut length accuracy of plus or minus 0.008 inch can be provided depending upon the customer's requirements.



### MONEY-BACK TRIAL OFFER Order a trial gallon of each today for testing in your shop. We'll cancel the bill if you're not satisfied.

prevents heat treat scale... up to 1500°F. Brush on, heat, brush off. All metals.

cut weld cleaning time by 85%

Throw away your cold chisel and whisk off weld spatter with a dry rag! Protect-O-Metal spatter-proofing compounds make weld cleaning a breeze. Improve your welds at the same time . . . P-O-M compounds quiet the arc, improve fusion and electrode operation, prevent oxidation and annealing scale, cause no porosity. No smoke odors, or fumes.

P-O-M No. 2. Non-inflammable, non-toxic water-soluble paste. Inorganic. Thin before applying and start welding at once. \$3.40 per gallon, f.o.b. Dayton.

P-O-M No. 8. Rust- and corrosion-resistant resin base compound. Comes ready to use. Safe for all metals. Good paint primer; permits outdoor storage of subassemblies. \$3.45 per gallon, f.o.b. Dayton.

### PROTECT-O-METAL

G. W. SMITH & SONS, INC.

ds. 1702 SPAULDING RD., DAYTON 3, OHIO
For more data circle 517 on Postpaid Card



# FAST! 2 TON GREENERD HYDRAULIC PRESS

38 Four Inch Cycles Per Min.

11" Daylight

101/2" Diameter

### **ELECTRIC DUAL RAM CONTROL**

Model #B-2 is best for fast assembling, forming, riveting, staking, molding and many more applications where speed and accuracy are imperative.

See Your Dealer or write for Catalog M-42

Greenerd ARBOR PRESS CO.

For more data circle 518 on Postpaid Card







Among its 2000 items in 88 pages you are sure to find the latest in standard tool room needs. Also many new and ingenious items to speed up production and improve the appearance or efficiency of your product. All of highest quality and moderate prices.

Send for it today. You'll be glad you did.

ITS FREE!

REID TOOL SUPPLY CO.

For more data circle 519 on Postpaid Card

### new equipment . . .

Optional equipment, such as coil ramp, coil lift, peeler (for heavier gauge materials), tracking device, edge trimmer, scrap chopper and stacking unit is available. The necessity of any of the optional equipment depends on customer requirements.

The entire Lennox Line has a centralized control system which includes a control console, auxiliary electrical control cabinets, variable speed drive unit, all inter-connecting wiring, terminal boxes, conduit and related equipment. All wires are numbered and mounted to terminal strips to facilitate disassembly and reassembly. For more data circle 127 on Postpaid Card

\* modern machine shop

#### MARKING FIXTURE

A special marking fixture for identifying aluminum channels, angles and shapes without distortion has been developed by M. E. Cunningham Co., 1051 Chateau St., Pittsburgh 33, Pa. The Style F Aluminum Marker is a table-mounted fixture which is avail-



Cunningham Style F Aluminum Marker

able in motor-driven or hand-operated models. The motor-powered unit includes a solenoid-operated clutch which allows the marking die to make a single revolution and then stop to accommodate the next part to be marked.

Designed to permit stamping of trade marks or any combination of letter or figure codings, the Style F Aluminum Marker fixture can include a stationary mandrel to fill the channel opening, preventing deformation during marking. When marking extruded shapes, nesting bars can be furnished to suit. Marking is accomplished by the fixture's passing the channel under a rotating die. Clean impressions are assured since the channel travels with the die. A slight modification to the Style F allows accommodating a range of channels from 1/4 inch and up. The marking roll can be made as a solid die, slotted to accept interchangeable steel type, or a combination interchangeable logotype and replaceable type.

For more data circle 128 on Postpaid Card

modern machine shop \*

### COLD IMPACT EXTRUDED SOCKETS

J. H. Williams & Co., 412 Vulcan St., Buffalo 7, N. Y., has introduced the Combo Socket Set. With only seven basic driver parts, the mechanic can make hundreds of different drive



View shows Williams Combo Socket Set



## Paramount FELT BOBS

18 sizes, seven shapes, four degrees of hardness—a total of 504 Paramount Felt Bobs always ready to solve your most difficult precision finishing problems. Available with mandrels or unmounted. Finest quality wool felt.

#### Put a Paramount Bob on the Job

- For polishing surfaces that must be held to close tolerances.
- For buffing or lapping hard-to-reach spots.
- For de-burring and touching up.
- For close-quarter precision finishing on all metal surfaces.

Get better finishes for less cost — "Put a bob on the job." See your Paramount jobber or write for literature. Ask about K-1 and K-2 Bob Assortment Kits that cost far less than buying bobs separately.

K-1 contains 66 pieces ......\$10.95 K-2 (K-1 plus 4 compound sticks) \$12.95

### Bacon Felt Company 11 Fifth Street Taunton, Massachusetts

For more data circle 520 on Postpaid Card

combinations, from a flexible ratchet head to a sliding Tee-Bar. Eleven socket sizes range from 3/8 to 1 inch, by sixteenths.

In addition to its unique design, the Combo set features sockets made by Williams' cold impact extrusion process. Extremely close tolerances,



New Federal COMBIN-O-TOOL Method Saves up to 46% on Short Run Stampings



Some typical parts produced by Federal Combin-O-Tool Method.

Combined operations mean lower cost short run stampings whenever they can be produced by the Federal Combin-Q-Tool Method.

Where it formerly took 4 or 5 operations—it can now be done by Federal with only 2 or 3 operations. The labor savings are passed on to you in lower cost stampings. Send your prints or parts today to see if they can be done with the new Federal Combin-O-Tool Method. The savings will please you.

FEDERAL

SHORT RUN STAMPINGS Federal Tool & Mig. Co.

3615 Alebame Ave., Minneapelis 16, Minn. Federal Short Run Stamping, Inc., 915 Lyell, Rechester, N.Y. Federal Stamping Company, 7315 Atoll, N. Hollywood, Cal. For more data circle 522 on Postpaid Card

262 MODERN MACHINE SHOP

improved concentricity and great strength team up to provide maximum tool-power in sockets.

For more data circle 129 on Postpaid Card

\* modern machine shop

#### **TOOL SETTING GAGE**

The Heald Machine Co., Worcester, Mass., has announced a tool setting gage named Tool-Tronic. The Tool-Tronic gage is a combination optical and electronic device for establishing tool point location. Said to be one of the most accurate instruments of its kind available, it permits precision location of tool points within 0.000025 in relation to workpiece. Featuring speed and ease of operation it does not require specially trained operator's skill beyond that needed to run the basic machine on which it is used.

A compact portable package of two basic units, the Tool-Tronic gage consists of a gage-sensing head mounted vertically over the tool position which houses the light source lenses and photo-sensing cells. The unit is connected electrically to a reading cabinet housing an electronic amplifier power supply and two tool location indicating meters.

In operation the tool is introduced into the orifice of the gage-sensing head interrupting a part of the precision light rays passing from the light source to photo-sensitive cells. The distribution of remaining light by-



September, 1961



View of Heald Tool-Tronic Tool Setting Gage

passing the tool is picked up by photo sensitive cells, which, in turn, show any given tool position. These positions are recorded on the two meters in the cabinet. Zero readings on the X and Y axes are reached by moving the tool with machine table and cross slide. The tool point is then in position at a known location with reference to workholding spindle centerline and flange face. Return and repeatability to this position are positive.

\* modern machine shop \*

### MICRO-DRILLING MACHINE

A micro supersensitive small hole drilling machine fully balanced and primarily designed for the instrument, electronics, optical, watch and similar industries for production use is now being marketed by Wohlnip Products, Inc., 634 Central Ave., East Orange, N. J. The high precision hollow (honed) spindle has an inside taper for using the most accurate precision collets as well as an outside taper for using a precision keyless drill chuck. The spindle assembly includes four preloaded precision balanced ball bearings for maximum accuracy. The



### **ROLL-O-MARK**

Noblewest ROLL-O-MARK is the world's most versatile general purpose marking machine. It produces sharp, clear permanent indented impressions into metal, wood, plastic and other materials. Model 50P1, shown, has air powered work table and die slide. With Cyclomatic Control will mark up to 1500 pieces per hour. Other models with manual or semi-pneumatic operation. Write for specifications.

NOBLE & WESTBROOK MANUFACTURING CO. 25 Westbrook St., East Hartford 8, Conn.



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MODERN MACHINE SHOP

263

### NOW . . . accuracy to tenths on the model 1A



## LINLEY JIG BORER

Meets exacting requirements for tool and die work, or small precision jobs found in most shops. Guaranteed lead screw accuracy .0001 over entire range. A precision producer at a moderate cost. Releases large capacity borers for heavier jobs. Check on the savings that are possible with the new Model 1A Linley.

TABLE SIZE: 7"x171/2"

TABLE TRAVEL: 61/2"x10"

### LINLEY BROTHERS CO.

661 State St. Ext., Bridgeport 1, Conn.

For more data circle 525 on Postpaid Card

## STEVENS — THREE-IN-ONE ROTARY COMPOUND TABLES IN 3 SIZES



Can be used as ROTARY
COMPOUND TABLE or
separated to use individually as Compound
table alone and Rotary table alone—all on
one investment.

The Stevens-Three-in-One will save set-up time and reduce inaccuracies caused by multiple set-ups.

See your dealer or write for bulletins

The John B. Stevens Company
Main Stryet, Somersville, Conn., U. S. A.

For more data circle 526 on Postpaid Card

new equipment . . .



Wohlnip Model 1/8 W Micro-Drilling Machine

down-feed shaft has an anti-backlash feature supported in two precision balanced ball bearings.

The Model ½ W Micro-Drilling Machine has a drilling capacity (in steel) of ½ inch and is provided with eight spindle speeds from 700 to 11,000 r.p.m. The unit measures 12 inches high overall by 8 inches wide overall and has an overall depth of 15 inches. The net weight of the unit is 35 pounds.

For more data circle 131 on Postpaid Card

\* modern machine shop \*

### REMOTE CONTROL STEREOMICROSCOPE

Bausch & Lomb, Inc., 83918 Bausch St., Rochester 2, N. Y., has announced a Remote Control Stereomicroscope with a fully-integrated zoom optical system. Outstanding advantages include a continuous range of magnification from 1x to 60x, and a unique sealing tube which permits the instrument to be repositioned at different

points in a "hot" cell without danger of any contamination.

The L-shaped unit. developed for the study of radioactive materials, has two main components: a stereomicroscope and a sealing tube. Self-contained, built-in shielding, equivalent to 12 inches of lead, protects the operator from radiation from the cell access port when the instrument is in position. Although the standard model is designed for use in a thirty-six inch wall, modifications make it possible for installations in walls up to sixty inches in thickness. Applications include the examination of surface data on corrosion samples and fuel elements after radiation. The B&L Remote Control Stereomicroscope can also be used for metallurgical examinations which involve the cutting, grinding, polishing and mounting of specimens.

The heart of the instrument is a stereomicroscope, incorporating a 1x to 4x zoom system, and three sets of wide field eyepieces, (10x, 20x, and a special 5.5x for low power work). The operator can make a continuous visual examination of specimens from 1x to 60x, including any fractional point within the



### Superior Performance... Longer Life Yours With Reed Knurls

Reed Knurls produce accurate, smoothly finished surfaces. Careful selection of steel, controlled heat treatment and an exclusive lapped finish insure maximum life. Precise manufacturing control provides uniformity of tooth form, diameter, thickness, hole size and concentricity.

Reed stocks over 170 styles and sizes of *circular* pitch and *diametral* pitch knurls. As the pioneer-leader in the development of all types of thread and form rolling equipment, let us solve your knurling problems. Reed Knurls are stocked by your industrial Supply Distributor.

### REED



ROLLED THREAD DIE CO.

Subsidiary of Union Twist Drill Company HOLDEN, MASSACHUSETTS

Specialists in Thread and Form Rolling Tools and Equipment

For more data circle 527 on Postpaid Card

range. Supplied as standard equipment is a 35mm, stereo camera in a swing-on bracket which fits with lighttight connection over the eyepieces.

The zoom optical system is contained in a special "power pod" located entirely on the external or "cold"

### "SEALFLEX" TUBING



Leakproof-Stays in place For Coolants, Cutting Oils, Solvents Made of steel with brass

fittings — males, nozzles, stopcocks, etc., made in 1/8", 1/4", 3/8", 1/2", 3/4" I.D. Write for bulletin and prices.

VERMONT FLEXIBLE TUBING CO.

Lyndonville, Vermont

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### THE NOZZLE VALVE WITH THE INTERNAL FULCRUM LEVER



AIR-WAY PUMP & EQUIPMENT (O. 1046 N. Kilbourn Ave., Chicago 51, III.

easy-to-use.

requirements.

Sizes and types ments. Send for

For more data circle 529 on Postpaid Card



B & L Remote Control Stereomicroscope

side of the cell wall. This eliminates the need to have mechanical linkages previously required for remote changing of objectives. All instrument components can be removed or replaced without the problem of decontamination, since the unit is mounted in a hermetically sealed tube.

Elements within the sealed power pod are completely protected from dust, moisture and atmospheric conditions. The transmitting optics, housed in the horizontal section of the instrument, and the window in the sealing tube are made of non-browning glass. For more data circle 132 on Postpaid Card

modern machine shop

#### PARALLEL STRAIGHT EDGE

A parallel straight edge with a built-in level, which is available in both lightweight aluminum and standard semi-steel, has been announced by The Challenge Machinery Co., Grand Haven, Mich. The parallel straight edge provides a dual purpose tool that



For more data circle 530 on Postpaid Card

literature.



View of Challenge Parallel Straight Edge

makes it possible to check both the levelness of a machine bed and its

accuracy at the same time. The position of the level makes it also possible to use the parallel straight edge for all standard applications, such as positioning work above and parallel to the surface plate when checking or scribing parts.

The lightweight aluminum model with special hardened, wear-resistant surfaces, provides a unit that is easily moved about by one man. A six foot unit weighs only 35 pounds.

Also available for other applications are standard semi-steel units. All working surfaces on both types are precision ground flat and parallel to within 0.0005 of an inch overall.

For more data circle 133 on Postpaid Card

### INDEX CENTER

Finer tolerances in inspection of work on centers, and in jig boring, milling, and jig grinding work on centers are said to be assured with the Moore Precision Index Center produced by the Moore Special Tool Co., Inc., 730 Union Ave., Bridgeport 7, Conn. The index center is said to also achieve peak precision on form grinding of spiders, splined punches, gear die



THERE IS NO ROOM FOR GUESSWORK
IN PRODUCING EXTREME ACCURACIES

Only Wadell systems can promise and deliver precision in millionths with the "MICRO-MAGIC" tooling system. Quick change tools can be pre-set and/or adjusted in tenths.

If you are still trying to predict how much your present machine will vary due to thermal distortion you should investigate Wadell Precision Boring Systems. . . Micro-Magic Tools, Precision Boring Machines and all accessories.



Write for complete catalog.

WADELL EQUIPMENT CO., INC.

CLARK 2, NEW JERSEY

For more data circle 531 on Postpaid Card

punches and dies, and sectional parts of dies, where revolving the part on centers or in a spindle is necessary.

Major features include a special ball construction spindle; also a lapped carbide index plug and four lapped-fit carbide plug-in-stations. The extra plug-in-station allows the user to turn his workpiece exactly 180 degrees at any time to get his work on dead



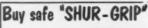
### DRILL THESE HOLES

BY A QUICK, EASY, INEXPENSIVE METHOD

Your business letterhead will bring literature.

WATTS BROS. TOOL WORKS Wilmerding, Pa.

For more data circle 532 on Postpaid Card



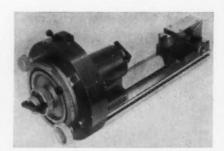
### drop forged HANDLES

Designed to hold 3 to 6 lb. lead hammen heads more firmfy — will not slip — keeps hammer head in shape longer — makes remolding easier, quicker, surer, less expen-

Write for circular and prices

67 MASSASOIT AVE., EAST PROVIDENCE, R. I.

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View shows Moore Precision Index Center

center. It can also be used to reorient for a different set of angles on the same workpiece. There is an accurately adjustable tail stock, and centerline-up is maintained with lapped-fit ram movement of center. Offset tailstock construction allows clearance for wheel when slot-grinding. Sealed against dirt, the Moore Precision Index Center can also be used in wet grinding.

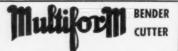
For more data circle 134 on Postpaid Card

\* modern machine shop

#### BILLET WHEELS

The Bonded Abrasives Division of the Carborundum Co., Niagara Falls, N. Y., has announced two lines of heavy duty billet wheels which, according to the manufacturer, are reducing cost per pound metal removed from 12 to 29 percent in steel plants where at least a 3 months' performance





BENDS, CUTS, PUNCHES

Available in hand, air and hydraulic models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to punch, bend, and cut round or flat brass, branze, aluminum, steel, etc., up to  $\frac{1}{2}$  as illustrated, other models up to  $\frac{1}{2}$  x 8". Hand—Air—Hydraulic

J. A. RICHARDS CO. KALAMAZOO, MICH., Dept. 6M

For more data circle 534 on Postpaid Card

\_\_\_\_

record has been compiled. The lines include both hot pressed and cold pressed heavy duty billet wheels. The hot pressed wheels take the measure of new high speed heads which operate at 12,500 s.f.p.m. and the cold pressed wheels are said to not only give superior performance on swing frame grinders but have produced up to 20 percent per pound cost reduction on stainless steel billets being processed on mechanical grinders at 9,500 s.f.p.m. under 450 lb. head pres-

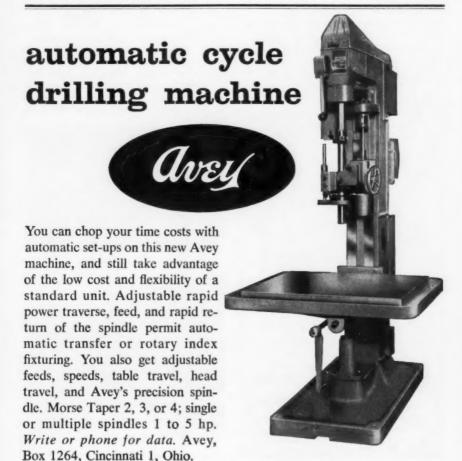
sure. The line of heavy duty hot pressed resinoid billet wheels are super strong wheels designed principally for grinding stainless and other special alloy steels.

For more data circle 135 on Postpaid Card

\* modern machine shop \*

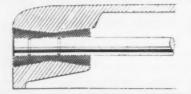
### **GRINDING FIXTURE**

Grinding of gun drill noses has been simplified with the development of an easily operated rocker base nose grind-



For more data circle 535 on Postpaid Card

### CERROTECHNICS SAUCE MONEY **Anchoring Non-Moving Parts** in Machinery



CERRROTECHNICS -- the technology of using CERRO\* ALLOYS to expedite industrial operations.

These radial saw slide rods are aligned in oversize holes with holding fixtures and secured with molten CERRROMATRIX. In this application a few pounds of alloy saved 37 hours machining time. Send for full information. \*T.M. Cerro Corp.

#### CERRO SALES CORPORATION

SUBBIDIARY OF CERRO CORPORATION Room 1501, 300 Park Avenue, New York 22, N. Y.

For more data circle 536 on Postpaid Card

### ENGINE LATHE ACCURACY TURRET LATHE PRODUCTION



For any Lathe from 10" to 24" swing. Repetitive indexing in all 6 positions to plus or minus .0003.

Turret body does not raise up when indexing. Write for folder.

RELIABLE REPRESENTATIVES WANTED



For more data circle 537 on Postpaid Card

### new equipment . . .

ing fixture. Engineered by Eldorado Tool and Manufacturing Corp., 364 Boston Post Rd., Milford, Conn., the fixture may be used on any simple bench or pedestal grinder with a diamond wheel for grinding gun drill noses to proper sharpness. The Eldorado fixture has two parts-a rocker base that is set on the grinder's angle table and a block for holding the gun drill securely on the fixture.

Two types of drill holding blocks are available. A micrometer block with micrometer stop accommodates drills of from 0.2500 inch to 1 inch diameter. Individual blocks, for specific sizes of gun drills, are available for sizes between 0.078 inch diameter through 1 inch.

For more data circle 136 on Postpaid Card





**Eldorado Rocker Base Nose Grinding Fixture** 

September, 1961

### HEIGHT GAGE

A series of master vernier height gages combining correct balance and weight for easy handling in applications where a lighter weight gage is preferred has been developed by The L. S. Starrett Company, Athol, Massachusetts. Available in 12-inch and 18-inch sizes, these height gages feature a long, 50-division vernier with widely spaced, easy-to-read graduations to simplify setting and reading

without the aid of a magnifying glass. The "openface" design also permits having half as many bar graduations, a further aid to easy, accurate reading.

The vernier scale is also flush fitted in the same plane as the main scale to insure exact alignment of matching lines on bar and vernier with no parallax problems to cause reading errors. Other features of these height gages in-

Starrett Master Vernier Height Gage

clude no-glare Satin-Chrome finish on all reading surfaces; master bar hardered and stabilized for rigidity and lasting accuracy and combination straight and angular ways for positive alignment of bar and slide.

For more data circle 137 on Postpaid Card

\* modern machine shop

### OPTIC GONIOMETER

W. Von Arnauld Co., Pompton Lakes, N. J., is now distributing the



WRITE FOR BULLETIN S-5757

23898 LAKELAND BLVD. • CLEVELAND 23, OHIO

TAGAT INCORPORATED

USE MORE SPINDLES TO DO MORE WORK
For more data circle 538 on Postpaid Card

September, 1961

MODERN MACHINE SHOP

271

Wego-Patent Optic Goniometer for use in measuring all forthcoming tool cutting edges. In a matter of seconds, the user is in a position to verify, with this tool and with optical exactness, any cutting edge he may sight.

Features of the Wego-Patent Goniometer include an adjustable eye-piece; Angulometric microscope with built-in



Preforms in over 300 shapes, sizes and bonds for all barrel and vibratory operations.

- Finest bonding materials
- · No "roll-over" of burrs
- Minimum media fracture
   Maximum production

Free lab service reports proper media for your parts.

Write today for our Tumbling Media File.

### Fortune Industries, Inc. 11770 DEXTER RD. CHELSEA, MICH. Phone GR. 9-3621

For more data circle 539 on Postpaid Card



View shows Wego-Patent Optic Gonlometer

adjustment of crosshairs; knurling screw for adjusting the crosshairs; light contrivance (annular light with trafo); swinging arm with retaining screw; circular guidances with supports, concertina walls and staple covers; and measuring prism adjustable to the right and to the left by 15 mm. each, with measuring drum and two permanent magnets.

For more data circle 138 on Postpaid Card

\* modern machine shop \*

### COUNTERSINK

Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich., have announc-



N.C. In all S.A.E. sizes.

Here is the faster, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench—no other tools needed. Get more work now—save money tool

HEIMANN MFG. CO. • URBANA, OHIO

For more data circle 540 on Postpaid Card



View of Whitman & Barnes Countersink

ed the addition of high speed countersinks to its cutting tool line. Featuring a single flute construction, these high speed countersinks are made for machine use and light portable work.

According to the company, they provide easy feeding, smooth burr-free holes, and chatterless operation over a wide range of speeds and in a variety of materials. The countersinks are available in 1/4, 3/8, 1/2 and 1 inch sizes, with included point angles of 60, 82 and 90 degrees.

For more data circle 139 on Postpaid Card

### CONE DRILL

Fewer tool changes and elimination of separate finishing steps in some drilling operations are said to be made possible with a cone drill that has been developed by Scully-Jones and Company, 1909 South Rockwell St., Chicago 8, Ill. A single drill

produces a wide variety of hole diameters in metal, plastic, or any other relatively thin material. Tool change time and need for stocking a variety of drill sizes are eliminated. The tool drills any holes size from ½ inch to 1½ inches.

The cone drill eliminates circular hack sawing or knockout punching in sheet metal work. It has a 7/32 inch diameter drill point, so no center drilling or punching is necessary. For precise hole sizes, the operator scribes

## Simple, low-cost bench-type brinell HARDNESS TESTER

Motorized hydraulic pump and fingertip control through time-proved relief valve prevent operator from overloading or applying load too fast. Load verified on sensitive gauge. The Riehle Bench-type Brinell Hardness Tester is so economical and simple to operate that now even the smaller shops can do accurate Brinell testing. 34" stroke permits anvil height to remain fixed when testing a series of similar thicknesses. Accuracy unaffected by frequent changing of Brinell loads.

Other Riehle Brinell hardness testers include portable and floor mounted models. Write for literature and name of nearest Riehle representative. Address Dept. MMS-961.

OTHER MODELS AVAILABLE — Floor-mounted, bench and portable models for Vickers, Knoop, Rockwell & Superficial Hardness Scales also available with a full selection of accessories for special applications.

### Riehle®

American Machine and Metals In

American Machine and Metals, Inc.

For more data circle 541 on Postpaid Card

holes of different diameters and then drills accurately to size. Abilities to remove a continuous chip and leave no burr inside the hole after drilling eliminate subsequent finishing operations.

The cone drill has a 4 degree lead on the flute, 0.006 inch radial relief, positive rake, and a 0.002 inch clearance on the land. It is made of solid high-

### ALSCO Self-Locking Tool and Die Makers' Springs



 Made in four lengths from 1" to 23/4" and eight thicknesses from .010 to .032. Low cost, handy, neat looking.

Write for details.

ALSCO CO., 81 Rochester St., Lima, N. Y.

For more data circle 542 on Postpaid Card



Outfits include from 80 to 154 pieces of type—plus a holder made from non-spalling, non-mushrooming Mecco Safety steel. Wrise for Bulletin UT.



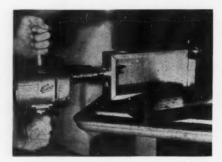
A product of the Marking Device Industry

M. E. CUNNINGHAM CO. 1051 Chateau Street, Pittsburgh 33, Pa.

For more data circle 543 on Postpaid Card

MODERN MACHINE SHOP

274



Scully-Jones Cone Drill in operation

speed steel, hardened to 63-64 Rockwell and carefully ground. The Scully-Jones cone drill is furnished with a straight shank 3/8 inch by 1-11/16 inch. The Flute length is 2¾ inches and over-all length is 4-7/16 inches. The body is 1¾ inch in diameter at the large end and has a 25 degree included angle. Cone drills can be used in power tools of ½ inch drill capacity, in drill presses and similar machines. Recommended speed after the hole is started is 500-600 r.p.m. Speed for starting a hole can be much higher.

For more data circle 140 on Postpaid Card

\* modern machine shop \*

### VERNIER CALIPER

A 12-inch vernier caliper has been announced by Scherr-Tumico, Inc., 301 Armstrong Blvd., North, St.



ADJUSTABLE CLAMP COMPANY

436 N. Ashland Ave. Chicago 22, III.
For more data circle 544 on Postpaid Card

September, 1961



Scherr-Tumico 12-inch Vernier Caliper

James, Minn., for measurement to 1/1000-inch English scale or 1/50 mm. metric scale. The vernier is adjustable, and the vernier scale is long for easy

reading. The graduations are recessed. They are clear cut, dark and easily read without guesswork or the use of a glass.

The jaws are 21/4 inches long. They are hardened, ground and precision lapped. Approximate maximum rib width with iaws closed is 0.300 inch. Graduations for outside measurement appear on one side and graduations for direct inside measurement appear on the other side. For more data circle 141 on Postpaid Card

### LATHE CUTTING TOOLS

\* \* \*

A system of lathe cutting tools identified as Impero is now being distributed by Hardware Specialty Co., Inc., 48-75 36th St., Long Island City 1, N. Y. The system includes large sturdy tool posts which insure maximum rigidity for the toolholders and cutting tools, thus reducing chatter and vibration while extending the life of the cutting edges. The versatile double-headed rotary cutting tools allow for instantaneous change from one operation to the next by finger-tip controlled adjustments. According to the manufacturer, the constantly



For more data circle 545 on Postpaid Card

aligned precision accuracy is retained in change-over of operations since the tool post is precentered when initially mounted on the lathe.

The Impero Tool Posts, Toolholders and Cutting Tools are designed for adaptation to any lathe of any size. For more data circle 142 on Postpaid Card



This new precision offset boring head is designed for ½" to 1" bar capacity. Features long, stocky tool block for securing the tool. Vernier simplifies close visual adjustment.

INTERCHANGEABLE ARBORS AND SHANKS SAFETY ROUND CONTOURS

Complete Line of Boring Heads and Tools

WRITE FOR CATALOG

FLYNN MANUFACTURING CO. 18301 WEAVER, DETROIT, MICHIGAN

For more data circle 546 on Postpaid Card

### CONTROL ACCESSORY FOR PORTABLE DRILLING AND TAPPING UNITS

A control accessory that permits users to drill and tap automatically in one operation with combination tools, has been introduced by The Dumore Company, 1302 Seventeenth St., Racine, Wis. Designed to provide the close thrust control required, the accessory is called the Drill and Tap Control and is engineered to be quickly and easily attached to the Dumore Series 28 "Drill-N-Tap" Portable Drilling Units.

Regulated spindle thrusts provided by the accessory is said to enable Series 28 users to take advantage of production economies offered by combination tools. During the drilling portion of the stroke, the control is idle to provide maximum allowable thrust for rapid metal removal. As the threaded section of the tool engages the work, the control "cancels out" a predetermined portion of the advance pressure, producing a light, tapping thrust that allows the tool to feed itself into the work without excessive tool or material stresses. Quickly adjustable, the control facilitates rapid changes in tool sizes or material. Once adjusted, it provides consistently uniform thrusts in cycle after cycle, eliminating tool breakage. Advance and retract feed rates of Series 28 Units can be easily adjusted to match



### CAMS

Complete Facilities For

CAM MILLING & CAM GRINDING

To Your Specifications

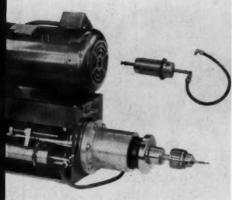
23-16 44th ROAD

CAM SERVICES CO.

DIVISION OF HIMOFF MACHINE CO.

LONG ISLAND CITY, N. Y.

For more data circle 547 on Postpaid Card



View shows Dumore Drill and Tap Control

tap lead—no pulling out last thread on tool withdrawal.

The control is installed in minutes and removed just as quickly for operation of the Series 28 Unit with conventional drills and taps. The company claims easy installation, simple adjustment and accurate thrust control gives Dumore Series 28 users greater flexibility that reduces cost, increases production and saves space. Two Drill and Tap Control models are available—one model for single tool use and the other model for use with multiple spindle attachments.

For more data circle 143 on Postpaid Card

\* modern machine shop \*

### OPTICAL TOOL FOR CHECKING ANGULARITY AND ALIGNMENT

Michigan Tool Co., 7171 East McNichols, Detroit, Mich., has added a high precision optical tool, for checking angularity and alignment, to its regular line of production and checking equipment. In effect a 360 sided optical polygon, the Milichex MOX-3600 is a multi-purpose tool for optically checking alignment and angular spacing in any multiple of full degrees.



When used with an autocollimator or similar optical sighting device the optical polygon provides an accurate mirror surface which reflects the projected image of the sighting device's cross hairs. The amount of deviation between the reflected image and the graduated cross hairs in the sighting device gives a geometric check on misalignment, parallelism, angularity, and so on.

The heart of the instrument consists of two matching sets of 360 ground and lapped teeth. In operation, the unlocking knob raises the upper set of teeth and permits the table top (with optical mirror) to be rotated to any full degree angular setting as indicated on the scale. A magnifying glass is mounted in place for easy viewing. When the knob is returned to the "locked" position, upper and lower



Milichex Model MOX-3600 Optical Tool

sets of teeth mesh and automatically lock into exact angular position. A magnet is integral with the base for holding the instrument in place. Accu-



### **DURANT TOOL COMPANY**

Write for information on initial stock plan and for free folder, including prices and distributors in your area.

17 THURBERS AVENUE, PROVIDENCE 5, RHODE ISLAND

For more data circle 549 on Postpaid Card

.,,

racy of the Milichex is said to be within  $\frac{1}{4}$  second of arc or 12 millionths at a 20 inch diameter.

For more data circle 144 on Postpaid Card

\* modern machine shop

#### SAW WITH GRINDER

Production Machinery, Inc., 4941 West Belmont Ave., Chicago 41, Ill., has introduced an imported Promacut Uni-14SA, Multi-Purpose Cut-Off Saw and Pedestal Grinder which is a combination of the versatile Promacut Saw and a general purpose grinding wheel. It makes accurate cuts of all types in carbon and stainless steel as well as many of the new alloys, without clamping or coolant. Straight cuts, miters, notches and incisions can be made by either free hand or table cutting.

The 14SA employs the same Promacutting principle as larger units, based

## The Accurate Way to test MICRO and MACRO hardness

Wilson TUKON testers make and measure extremely shallow indentations. They are used, for example, by manufacturers of watches, hairsprings, needles and jewels. In laboratories, TUKON instruments test individual crystals or microscopic particles. On any job, they provide these important advantages:

Accuracy — Precision-built TUKON testers give consistently correct results. Loads are applied without friction or impact—Bausch & Lomb optical equipment is standard — vibration is closely controlled.

Long life—Simple design, rugged construction make TUKON testers as durable as a machine tool.

Easy operation — Even an unskilled operator can get perfect readings after a short training period.

Supplied complete — Special accessories available for various sizes and shapes.

A complete line of Wilson Rockwell instruments is available, including semi and fully automatic models.

For Perfect Readings Every Time, use Wilson "Brale" Diamond Penetrators for Rockwell testers, and Knoop and 136 Square Base Pyramid Indenters for microhardness testing.

Write for details—Ask for Catalog RT-58. It gives complete information on the TUKON tester as well as on the full line of Wilson Rockwell hardness testers.



Wilson TUKON hardness tester

## WILSON "ROCKWELL" HARDNESS TESTERS

Wilson Mechanical Instrument Division American Chain & Cable Company, Inc.

230-G Park Avenue, New York 17, New York
For more data circle 550 on Postpaid Card





Wide clamping ranges • Eliminates packing • Malleable casting • 6 sizes • Can't slip • Guaranteed durability.

Write for descriptive folder and price list.

ALPHA TOOL & SUPPLY CO. CLOSTER, NEW JERSEY

For more data circle 551 on Postpaid Card



THE RESERVE OF THE PARTY OF THE

FREE CATALOG #208

on Vises and Rotary Ta-

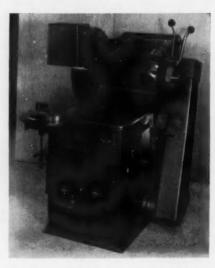
bles for Production, Tooling and Maintenance now. 70 different models and types—vise jaws from 1½" to 8".



1

PALMGREN PRODUCTS
8399 South Chicago Ave. • Chicago 17, Illinois
For more data circle 552 on Postpaid Card

new equipment . . .



Uni-14SA Cut-Off Saw and Pedestal Grinder

on tooth shape in an alloy steel circular saw. This produces a semi-milling action. Speed of rotation and high torque of the 5 h.p. direct-drive motor moves the blade through stock so fast that heat is not absorbed and the result is an almost burr free cut with no bluing of the metal. The approach of the saw to the stock holds work in position.

The company states that throughcuts on 2 by 2 x ½ inch angle are made in 1 second or less and up to 2500 such cuts can be made before resharpening. A 15 inch plate is easily cleared by head and column on a through-cut, making the 14SA ideally suited to production cut-off runs from long lengths of wide stock.

For more data circle 145 on Postpaid Card

\* modern machine shop \*

### DRIVING CENTERS

A line of special driving centers has been announced by PowerGrip, Inc.,



View of PowerGrip Special Driving Center

Rockfall, Connecticut, which is used

workpieces. This special line is engineered to hold tubular work pieces for o.d. turning, grinding, or cutting splines. Completely finishing the workpiece in one chucking is said to save time and produce better work to closer concentricity limits.

One special driving center has a long piloted center point, to position the work. The work can be loaded, either manually or by automatic loader. and will stay in position on this long center point until the tailstock moves in and driving points engage the workpieces. This style driving center is used when the o.d. must be completely machined from end to end. or where any out-

side holding would interfere with tools. Thus, it is desirable to hold the work from the i.d. A heavy cut can be taken from end to end because the drive pins grip the work near its maximum o.d.

For more data circle 146 on Postpaid Card modern machine shop

### ZIRCONIUM BASE ALLOY

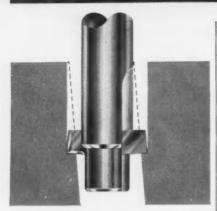
The Metallurgical Products Department of General Electric Co., Detroit 32, Mich., has announced the commer-



For more data circle 553 on Postpaid Card

### NEW! COMPENSAMATIC

SELF-COMPENSATING FOR MACHINE ALIGNMENT



### ONE PASS WITH CORE-RECTOR® CUTTER STRAIGHTENS ANY HOLE

Just set the feed for twice that of a single point roughing tool. Then slip the Muskegon bar with its pre-set CORE-RECTOR® CUTTER into your machine.

Thanks to Muskegon's balanced cutting action, you get a perfectly true bore — regardless of "core drift", faulty diameters or imperfect machine alignment. This cutter bores in one pass to straighten any existing hole, whether cast, drilled or flame cut.

Works with the same efficiency in multiple combinations including counterbores, spot facing and chamfering.

Write, wire or call for technical bulletin.

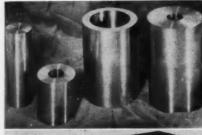
### MUSKEGON TOOL INDUSTRIES, INC.

11th at Western Muskegon, Michigan For more data circle 554 on Postpaid Card

### new equipment . . .

cial availability of Zircaloy 2 as produced by a unique powder metallurgy process. Zircaloy 2 is a zirconium base alloy which offers considerable promise to the nuclear industry due to its low neutron cross section, good mechanical strength, heat resistance, and excellent corrosion resistance to high temperature steam. In the nuclear industry it is used as fuel element cladding, structural parts, and supports.

For chemical applications this material is also resistant to acid and alkalies. At room temperature Zircaloy 2 would resist attack by most organic



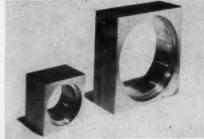


Illustration showing typical Zircaloy 2 shapes produced by vacuum powder metallurgy

## **BORING SYSTEM**

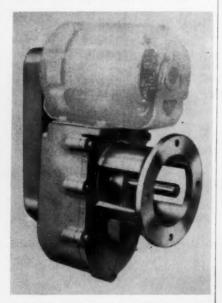
**ELIMINATES TAPERED AND OUT-OF-ROUND BORES** 

acids, all concentrations of nitric, some concentrations of sulphuric, and it generally resists hydrochloric and other chlorides. Alkaline solution attack is resisted and Zircaloy 2 has high resistance to corrosive materials. For more data circle 147 on Postpaid Card

\* modern machine shop

#### SPEED REDUCTION UNIT

Barnes Drill Co., 814 Chestnut St., Rockford, Ill., has introduced a spur gear speed reduction unit capable of use with small horse power motors. Although designed to operate on a polyphase motor, the BarnesdriL Speed Reducer can be used success-



BarnesdriL Spur Gear Speed Reduction Unit



ONE PASS WITH MICRO-FLOTE® BORING TOOL HOLDS SIZE TO .000050

Use twice the feed of a single point finishing tool. Change to pre-set MICRO-FLOTE® Boring Tool, You get bores with mirror finish while holding sizes to .000050—and you can adjust this tool while locked in the bar to .0001!

Muskegon Tool's new COMPENSA-MATIC® Boring System easily gives you twice as many bores as any single point tool in diameter 1" to 54"—no tapers, no out-of-rounds.

Works with the same micro-accuracy in multiple combinations including counter-bores, spot facing and chamfering.

Write, wire or call for technical bulletin.

## MUSKEGON

TOOL INDUSTRIES, INC.

11th at Western Muskegon, Michigan For more data circle 555 on Postpaid Card

MODERN MACHINE SHOP

283

September, 1961





## **TAPER PINS**

DIAS. 9/0 to #4

As specialists in stainless-steel, instrumenttype pins, we offer quantity runs of standard size Taper Pins. Tolerances are held to .001 on dia. Sizes run from #4 down to 9/0. Send your blueprints for prompt quotation.

## THE PEASLEE METAL PRODUCTS INC.

1851 Hercules Ave. • Clearwater, Fla. For more data circle 557 on Postpaid Card

## new equipment . . .

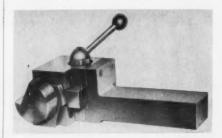
fully on a 110 volt, single phase motor. To facilitate reducing or increasing the speed ratio, the reducer is equipped with a belt and pulley. The reduction unit has a 450:1 gear ratio, and the belt has a 2:1 ratio; therefore, it provides an overall reduction of 900:1.

The reducer provides ratios of 450:1 with a 1750 r.p.m. motor and a 1:1 pulley ratio; and a 900:1 reduction with a 1750 r.p.m. motor and a 1:2 pulley ratio. A wide range of reduction ratios is available upon request. The reducer is recommended for applications requiring sturdy construction and exceptional reliability and is said to be best for applications requiring continuous performance due to the inherent characteristics of spur gear construction. The unit may be mounted either vertically or horizontally. For more data circle 148 on Postpaid Card

\* modern machine shop

## THREADING TOOL

National Acme Co., 183 East 131st St., Cleveland 8, Ohio, has introduced a single chaser Vers-O-Tool which backs off automatically at the end of the cutting stroke, boosting short run threading efficiency. Designed to prohibit any return stroke while at cutting depth, scrappage from damaged threads is eliminated. Available in two sizes for fine or coarse threads.



View of Namco Single Chaser Vers-O-Tool

the Namco Single Chaser Vers-O-Tool can be used on any lathe equipped with a lead screw and will cut taper threads with any standard taper attachment.

For more data circle 149 on Postpaid Card

modern machine shop

#### AIR SCREWDRIVER

A Thor "Straight-8" Air Screwdriver, featuring Thor Q. T. Silencer and Twin-Clutch Torque Control for

driving small screws and nuts up to Size 8 threaded fasteners, has been announced by Thor Power Tool Co., Aurora, Ill. The assembly line tool is built with a No. 101 Series (Thor-Nado) Air Motor featuring a five blade power booster (with a two blade air trap) for sustained power under load. Available in four speeds (500. 1,000, 2,200 and

Thor "Straight-8" Screwdriver

4,500 r.p.m.) the tool comes with a choice of Thor Sure-Shot Fastener Finder for slotted head screws, or Zip Chuck for interchangeable use of Phillips type bits, magnetic bits, or socket drivers.

The new series of tools is offered with "panic button" instant power reverse, or in non-reversible models. Both types are available in all speeds and chuck styles. Built-in "Air-Gard" regulator for pressure and speed control is standard on both models. Inter-

## $NOW\dots$ big machine quality in an economy priced compact band saw



Use it as a horizontal cut-off machine.



Use it as an upright band saw.

## THE NEW WELLS MODEL 300 METAL CUTTING BAND SAW

Would you like to make your metal cut-off jobs easier and more efficient? Would you like to be able to cut angles, slots, notches and bevels in the same machine?

You can do all of this with the new economical-to-buy and economical-to-use Wells Model 300 Metal Cutting

Band Saw. Just check these features:

3 ½" x 6" capacity (3 ½" dia., rounds)

• Selective speeds of 54, 100, 190 ft. per min.

Gravity feed and automatic shut-off for cut-off work

Exceptionally rigid construction
Well guarded—blade can be changed without remov-

ing guard Optional wheels and handle for complete mobility Get full details on this remarkable value from your Wellsaw Representative or write for Bulletin No. 230.



SAW SPECIALISTS SINCE 1925

WELLS MANUFACTURING CORP. 808 Tyler St. Three Rivers, Mich.

For more data circle 558 on Postpaid Card

## new equipment . . .

nally, the new series features all balland-needle bearing construction. Power-profile gear tooth design is said to assure greater gear-tooth contact area and longer gear life. Internal ring-gears are machined integral with the gear housing for permanent alignment. The new series is specifically designed for easy, low cost maintenance, with sturdy components and

RIVFTFRS PIONEERS and **PACEMAKERS** in their line head rivets from smallest to 3/4" diameter cold steel, either by NOISELESS SPINNING or VIBRATING HAMMER method-fast. economically—types in-clude Vertical and Horizontal Spindles, foot-power or automatic. Free estimates of your work. Write for catalog today. THE GRANT MFG. & MACHINE CO. 96 Silliman Ave. Bridgeport 5, Conn.

simple drop-out disassembly procedures for ready inspection and preventive maintenance operation.

For more data circle 150 on Postpaid Card

modern machine shop

#### COMPARATOR-MICROSCOPE

Linearscope, a large capacity optical measuring instrument has been announced by Stocker & Yale, Inc., 150 Green St., Marblehead, Mass., which provides interchangeable microscope or projection screen optics. Featuring an extremely long travel precision coordinate stage, the instrument provides for accurate measuring of large parts previously difficult to check by any method. In addition, many almost impossible measurements such as on internal diameters, checking the depths of internal grooves, and measuring internal radii and finishes become simple. Measuring capacity of the Linearscope is 4 by 12 inches in one setting. Direct micrometer readouts are 0.0005 inch and 0.0001 inch -with the "tenth" readings in the longitudinal (12 inch travel) direction.

In addition to the regular 20X or 40X monocular microscope eyepiece with crosshair reticule and integral vertical illumination, a 3 by 3 inch projection viewing screen with separate high intensity illuminator is available for rapid production checking. The projection optics range from 5X to 50X. 3D stereo and zoom optics may also be supplied for special appli-

For more data circle 559 on Postpaid Card



## SQUAR-VISE

· A Universal precision squaring setup.

 A precision machine vise for profilers, pantograph machines, duplicators, jigborers and surface grinders.

It stays square under clamping pressure.

 It is hardened and ground to supersquareness on all surfaces. Clamps are removable for setting up purposes.

Write for Literature

KEARSARGE TOOL & MFG. COMPANY, Erie, Pa.

For more data circle 560 on Postpaid Card



View shows Stocker & Yale Linearscope, a large capacity optical measuring instrument

cations and close visual inspection of chambers, blind holes, internal diameters and surface conditions. The stage is constructed of stabilized mechanite and is 20 inches long by 6 inches wide with 3 T-slots to adapt fixtures, combination vee-blocks, centers, rotary tables, and so on, which can be provided as accessories. The staging area and optical clearances are sufficient to accommodate many automotive, aircraft, tooling and machinery parts as well as molds, dies and smaller precision parts and assemblies. Construction throughout is particularly rugged to prevent table deflection and angular deviation. Because of the inherent stability of the Linearscope and its simplicity of construction and operation, maintenance is minimal.

For more data circle 151 on Postpaid Card modern machine shop

### SPECIAL DRILLING, COUNTERSINKING AND REAMING MACHINE

Avey Div., Motch & Merryweather Machinery Co., Cincinnati 1, Ohio, has

Angle Tangent to Radius WHEEL DRESSING ROTHFUSS TOOLS THE G-5 is a precision RADIUS DRESSER engineered

tool that will dress either a convex or a concave radius from .015" to 1.750" on all wheels up to 10" and it may be set to the exact radii desired. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal insures chatter free operation. Price \$80.50

### THE G-2 ANGLE DRESSER AND **TOOL HOLDER** is actually two tools in one, having an easy to read vernier scale 0° to 180° giving accuracy within 2" of 1°;

Price \$87.50

(including case

and both tools

with diamonds

milled, drilled, tapped on any desired angle. STORAGE CASE

an excellent time saver

to set up jobs to be

of light-weight steel, with a hinged top, heavy duty latch and a blocked interior to insure the safety of the dressers when carried.

## **OUR FIXTURES**

will dress most radii and angles tangent each other, similar to those shown below.

Distributorship available in select territories



BOX 2693 ELMWOOD STATION For more data circle 561 on Postpaid Card

September, 1961

MODERN MACHINE SHOP

## new equipment . . .

introduced an Avey Special Rotary Table Indexing Machine around which is mounted four No. 1 cam feed units and three No. 2 cam feed units. The table is 36 inches in diameter and has eight positions. All of these components have been mounted in and around a well ribbed fabricated stress relieved steel base. The fixtures have been made to accommodate two work-





View shows Avey No. 33067 Special Drilling, Countersinking and Reaming Machine.

pieces and arranged for automatic clamp and unclamp at the operator's position. The part made with this machine is an aluminum body which is produced at the rate of 150 parts per hour at 100 percent efficiency. For more data circle 152 on Postpaid Card

\* modern machine shop

#### SCALING HAMMER

Airetool Manufacturing Co., Springfield, Ohio, has announced a lightweight, pneumatically operated scaling hammer which is useful for removing



For more data circle 563 on Postpaid Card



View shows Airetool Scaling Hammer

metal splatter after welding, scaling off old paint and rust, cleaning sand from small castings, and general scaling, beading, peening and star drilling.

Weighing only four pounds and powered by a rugged Airetool Pneu-

matic Motor, the hammer produces 4600 blows per minute. Length of the tool, without the chisel, is 11 inches. A wide variety of precision manufactured pneumatic chisels is available to fit every job need.

For more data circle 153 on Postpaid Card

## DRILL PRESS

A versatile drill press has been announced by Rockwelll Manufacturing Co., Delta Power Tool Div., 606G North Lexington Ave., Pittsburgh 8, Pa. The Delta Unidrill, a two-footarm radial drill press, is designed for use in general industry and pattern shops; commercial and job shops; construction and building trades; and vocational - agricultural, trade and

industrial schools. The special qualities which make the Unidrill ideal for all of these fields are: the tool is moved and positioned instead of the work and it can be readily moved from one work area to another.

Another feature of the Unidrill is its exceptional flexibility which eliminates the need to move workpieces for various operations. A double swivel design saves the operator many steps in multiple drilling of large workpieces.



tion and tool life tremendously—permits heavier roughing cuts—saves drills, taps and other cutting tools—chips are blown away—reduces loading of grinding wheels and abrasive belts, last longer, work stays cool—no messy, wasteful brush applications. Available in 1 and 5 gallon sizes with one to six outlets.

SEND FOR NEW BULLETIN 37-CA

TRICO FUSE MFG. CO. MILWAUKEE 12, WIS.

For more data circle 564 on Postpaid Card

September, 1961

MODERN MACHINE SHOP

### new equipment . . .

The operator can quickly position the head from one central control station, yet the feed handle remains within easy reach. According to the company, the flexibility of the Unidrill enables the operator to position the cutting tool to the work in five different ways. The operator can move the entire mechanism up or down on the main

RADITURN



Convex, Concave or Ball

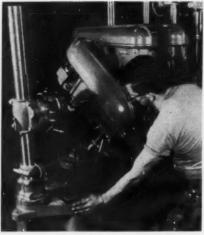
Patented

The accurate short cut for turning any radius. Adaptable to most any lathe.

Contact your tool supplier or write for details.

RETCO MFG. & SALES
2115 N. Delaware St. • Indianapolis 2, Ind.

For more data circle 565 on Postpaid Card



View of Delta Unidrill, a radial drill press

column, swivel the mechanism a full 360 degrees around the main column, rotate the head around the mounting post, move the head in and out from the column and the head can be tilted 45 degrees left or right, making angle drilling easy.

The Unidrill, it is claimed, will drill up to ½ inch diameter in cast iron and ¾ inch in steel. With a reach of more than two feet from the column to the spindle, the Unidrill will drill a hole anywhere in a workpiece 48 inches in diameter. The Unidrill is available in eight models—with utility or deluxe head, with slow or high speed pulleys,



## SAVE 50% of positioning time

With one set-up on a Cincinnati Gilbert universal table, you can drill at any angle up to 90° on 5 sides of a cube. Provides maximum support of work piece, assures rigidity and accuracy. Table sizes: 22" and 27" square, 22" high. For complete details and specs, ask for Bulletin 850.



Bulletin 850

THE CINCINNATI GILBERT MACHINE TOOL COMPANY . CINCINNATI 23, OHIO

For more data circle 566 on Postpaid Card

MODERN MACHINE SHOP

September, 1961

and with Morse Taper or key chuck spindle. Each of the eight models can be obtained as a bench or floor type machine.

For more data circle 154 on Postpaid Card

\* modern machine shop

means easier control and less operator fatigue. The permanently attached Dis-Card mount permits the wheel to be installed on the grinder in seconds. For more data circle 155 on Postpaid Card

\* modern machine shop

#### GRINDING WHEEL

A reinforced grinding wheel for weld grinding and light snagging has been named the Cut-N-Saucer wheel by Norton Company, Worcester 6, Mass.

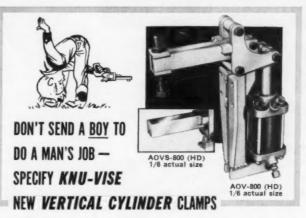
This wheel combines the advantages of a saucer shaped wheel with the convenience of a throwaway mount. The wheels are available in 7 and 9 inch sizes to fit standard threaded spindles on portable grinding equipment. The wheel's saucer shape permits the operator to hold the wheel at a closer angle to the work. This



Grinding Wheel

#### **ENGINE LATHES**

Additions have been made to the line of Clover Lathes which are distributed by Hermes Machine Tool Co., Inc., 48-15 Northern Blvd., Long



Tough, rugged and designed to do a man-sized clamping job—that's the *new* line of *vertical cylinder* air or oil operated clamps now being manufactured by Lapeer Knu-Vise.

The all new Heavy Duty AOV Series, features three basic sizes of 200, 400 and 800 lbs. clamping force respectively. Each size may be specified with either solid (inset) or channel toggle bars and spindle assembly (top).

Like all Knu-Vise products these powerful new vertical cylinder heavy-duty clamps were designed to give outstanding performance under the toughest manufacturing conditions. Such features as HARDENED AND GROUND BEARING BOLTS . . . HARDENED STEEL BUSHINGS . . . SELF-LOCKING NUTS FOR "TAKE-UP OF PLAY" . . . TOGGLE BARS MADE FROM COLD ROLLED STEEL . . . and EASY PARTS REPLACEMENT all assure you that when you specify Lapeer's KNU-VISE PRODUCTS you're "sending a man to do a man's job." Write today for complete information.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

#### KNU-VISE PRODUCTS

## LAPEER MANUFACTURING CO.

3048 DAVISON ROAD LAPEER, MICHIGAN WESTERN DIV.: PECK and LEWIS CORPORATION 4436 Long Beach Ave., Los Angeles 58, Calif., ADams 3-7146 CANADIAN DIV.: HIGGINSON EQUIP. SALES LTD, 1131 Petit Read, Burlington, Ontario.

For more data circle 567 on Postpaid Card

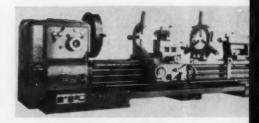
September, 1961

MODERN MACHINE SHOP

### new equipment . . .

Island City 1, N. Y. The additional sizes have a swing of 31, 37 and 41 inch swing over the bed and are available with a distance between centers from 40 up to 240 inches. With these models, the Clover Lathe Line has 9 sizes ranging from 14 up to 41 inch swing and with a 4 to 25 horsepower.

These lathes feature an all geared



Clover Engine Lathe distributed by Itermes

## LOOK! NO HANDS!



## "SURE CENTER" AIR VISE

FOR ECONOMICAL PIECE PART CHUCKING

- Automatically self-centering.
- Precise and instantaneous operation.
- Good visibility and chip room.
- Holding force over 5,500 lbs. at 100 lbs. pressure.
- Also hand operated.

Get the facts. Write for bulletin.

## HEUSER MANUFACTURING CO

1640 N. Paulina St., Chicago 22, Illinois 1201 Breakwater Ave., Cleveland 2, For more data circle 568 on Postpaid Card

headstock with hardened and ground gears, hardened and ground three bearing spindle mounted on double taper roller bearings, spindle control by hydraulic clutch and brake, totally enclosed quick change gear box, apron controlled by double multiple disc clutch adjustable from the outside for accurate and safe automatic stops, large capacity gap piece, automatic lubrication for headstock, quick change gear box, apron and bedways, and hardened and ground bedways. A rapid traverse for the carriage driven by an independent motor can also be supplied upon request. A safety device prevents to engage simultaneously the longitudinal feeds or the rapid traverse.

For more data circle 156 on Postpaid Card

modern machine shop

#### ANGLE ROLL

The Hill Acme Co., Kling Div.,



#### "SPOTTERS" SPELLMACO

A matched set of transfer punches for toolmakers, machinists and tool cribs

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc. Precision made of finest tool steel—Carefully heat treated and tempered for long life—.0025 undersize to facilitate use—Black oxide finish.

SET #3-17; 28 punches with indexed stand—sizes 1/32" to 1/2", by 1/4"-plus handy 11/32" size. Length 41/8". ONLY \$19.40.

Single sizes available

R. L. SPELLMAN CO. URBANA, OHIO

For more data circle 569 on Postpaid Card



View of Hill Acme Kling Pyramid Angle Roll

Ohio, who now manufactures and sells the entire line of Kling metalworking tools, has completely redesigned the Kling Pyramid Angle Roll. The unit, which rolls angles, channels, flat bars and so on, is made in several sizes to accommodate all normal industrial and construction needs.

Principal features are welded steel construction, with a totally enclosed worm gear drive, and a power elevating screw running on anti-friction bearings. The units are self-contained. The size ½A has a rolling speed of 30 feet per minute, weighs 9,000 lb., and has a capacity of 3½ by 3½ inches by ¾ inch in angles, 6 inches by 1 inch in flat bars, and 6 inches at 13 lb. channels. A 10 h.p. variable speed wound rotor motor is standard equipment.

For more data circle 157 on Postpaid Card

modern machine shop \*

#### PORTABLE AIR DRILLS

A line of powerful and compact air drills in straight and offset models has been introduced by Thomas C.

# Perfect Alignment! Maximum Accuracy!

Your guarantee when you order

# **ROOFE HEAVY-DUTY BULL NOSE Centers**

Make sure your next Heavy-Duty Centers are ROOFE "Bull Nose." Two double rows of bearings in the large and small ends of the nose allow perfect positive alignment on any type of work. Two shank sizes provide diameters from ½" to 7½" for a wide range of work with a single center. Write today for catalog.



## HOUSTON GRINDING & MFG. CO., Inc. P. O. BOX 7461 . HOUSTON 8, TEXAS

For more data circle 570 on Postpaid Card

September, 1961

MODERN MACHINE SHOP

## new equipment . . .

Wilson, Inc., 22-11 44th Ave., Long Island City, N. Y. Series 94 Drills have a drilling capacity up to 5/16 inch and a choice of eight speeds for efficient drilling of a wide range of materials including steel, cast iron, non-ferrous metals, and plastics.

Series 94 Drills are available in straight models with lever throttle or

#### CENTERLESS GRINDING

Straight cylindrical, shoulder, profile and multiple diameter, internal and surface grinding of any material. Precision ground taper pins and straight dowel pins. Brown & Sharpe and Swiss Automatic aircraft and standard screw machine parts, heat treated and ground, if necessary. Light bench type production drilling. Prompt service. Send prints for estimates.

## 31 YEARS—SERVING INDUSTRY PORTER MACHINE CO., INC.

Mfgrs. of Por-Matic air operated drilling fixture.

Drill bushings for same in stock.

3139 Enyart Ave. TR 1-4422 Cinti. 9, Ohio

For more data circle 571 on Postpaid Card



## TAP BUSHINGS

Drives all standard taps from No. 0 to 1 ½" and pipe taps from ½" to 1". Five o.d. sizes.

LESS TAP BREAKAGE LESS TAP WEAR Write for Bulletin

BYCO INDUSTRIES
2200 SNELLING AVE., MINNEAPOLIS, MINN.

For more data circle 572 on Postpaid Card



View of Wilson Compact Portable Air Drill

pushbutton throttle, and offset grip models with trigger throttle. Weight ranges from 1% to 2% pounds. Speeds available range from 500 to 16,000 revolutions per minute.

Features of Series 94 Air Drills include low air consumption, high-torque four-blade motors, built-in lubricators and speed regulators, adjustable exhaust deflectors, and hard-ened, ground, and honed cylinders for longer wear. Hardened, precision-cut gears are used throughout. Ample-size ball bearings support rotating parts, and planet gears are mounted on needle bearings.

For more data circle 158 on Postpaid Card



## WHY WASTE TIME?

Dress Profiles like these in a few minutes without Templates or Crusher Rolls with the Jeon Automatic Angle Tangent to Radius Dresser. It's fully universal.

Write for Price and Folder.
REPRESENTATIVES WANTED
IN SOME AREAS

JEDN MANUFACTURING CO.
P. O. BOX 6750 WASHINGTON 20, D. C.

For more data circle 573 on Postpaid Card



MODERN MACHINE SHOP

September, 1961

### TORQUE WRENCH

The P. A. Sturtevant Co., Addison, Illinois, has announced a high capacity torque wrench, the Model S600, which is said to allow direct reading up to 600 foot-pounds of torque. The operator need apply only 120 pounds of pressure to obtain 600 foot-pounds of torque and 60 pounds of pressure to exert 300 foot-pounds of torque.

Precise torque application is obtain-

ed through a sensory signaling device which provides a "momentary release" imparting a pulse to the operator's hand as well as sounding a tone when the desired preset torque is reached. In addition, the unit has the standard visual scale for "proof reading" the accuracy at any time.

The wrench, which weighs less than 17 pounds, inherits balance and feel through the redesigned snorkel head,

## production drill for precision holes



Let us show you how to knock hours off your production and precision drilling with this MA-8. Capacity to 3/8". Eight spindle speeds with 10:1 range (variable speeds optional). Hand feed or air hydraulic. 12" swing. Column or bench type. One to six of our famous precision spindles, which give you quiet, vibrationless speeds up to 12,000 rpm. Send for Bulletin 857 or phone us. Avey, Box 1264, Cincinnati 1, Ohio.

For more data circle 574 on Postpaid Card

September, 1961

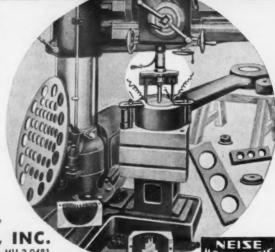
MODERN MACHINE SHOP

## THE BOREMASTER for ACCURATE TREPANNING

## **Bores Holes and Cores** in ONE OPERATION

- \* Bores 6" hole in 31/4" steel in 6 minutes.
- \* Bores 5" hole in boilerplate in 80 seconds.
- \* Rigid; Heavy-duty; Easy cutting; Timesaver.
- \* Excellent chip load distribution.
- ★ 5 Sizes, 11/2" to 113/4" to 8" depth.
- ★ With or without retractable pilot.
- \* Write for FREE catalog.

Sole U. S. Representative



MODERNTOOL

**PRECISION** HEAD"

KARL A. NEISE, INC. 400 4th Ave., New York 16, N.Y. - MU 3-0481

For more data circle 575 on Postpaid Card

MASTER WORKMANSHIP REQUIRES



TURNING UNDERCUTTING -BORING RECESSING -TAPER CUTTING

## Iniversal Facing & Boring Heads Feature:



- Automatic Feeds and End Release
- 9 Sizes to 36 ¼"
- 12 Feeds in 0.0008" Increments

Increase the capacity of any machine without facing facilities.

WRITE FOR COMPLETE CATALOG

Sole Agent for U.S.A. KARL A. NEISE, INC.

400 4th AVENUE, NEW YORK 16, N. Y. - Phone: MU 3-0481

NEISE ADDERNTOOL

For more data circle 576 on Postpaid Card



Sturtevant Model \$600 Torque Wrench

thus allowing the center section and the wrench beam section to operate in the same plane of action. A quick disconnect center section provides for easy shipping and storage. The S600 incorporates a standard ¾ inch male drive square. Quick disconnect adapter ends, such as a box or ratchet, are available.

For more data circle 159 on Postpaid Card

### DIAMOND NEEDLE FILES

Titan Tool Supply Company, Inc., 68 Comet Ave., Box B, Buffalo 16, N. Y., has announced a complete line of diamond needle files. The diamond needle files are particularly well-suited to sharpening, cutting and dressing hardened steel dies, carbide, ceramic and other super-hard materials. They have found extensive use in dressing hard Nitrited dies for extruding aluminum.

The files are available in twelve different shapes in the conventional hand file design. In addition, they are available as slot files or machine files. They are available mounted on a mandrel for use on hand filing machines. The diamond files are made in three grits: 200/240, fine, for polishing; 120/160, medium, for general utility use; and 80/100, coarse, for more rapid material removal. The diamond grains are permanently bonded to

## Standarize for Progress -



From this .... to this .... in minutes





Assembly at left is shown with stripper plate removed, exposing the Tru-Tex punch cluster and retainer unit. The right view points up the interchangeability of perforators and illustrates how broken and worn perforators can be replaced with a minimum of down time. No restrictions on the shapes of holes that can be pierced. Blades can be sharpened as a component in retainer. Write of descriptive folder today. Also distribute and produce Tru-Tex flat ground stock in 3 grades:

Oil-Tex, Air-Tex and "Lo-Carb". Made by toolmakers, for toolmakers.

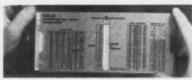
TRU-TEX DIVISION/THE H & R SUPPLY CO., 9925 DALY RD. P. O. BOX 104

For more data circle 577 on Postpaid Card

## KELM CALCULATORS

EASY - TO - USE . SAVE TIME!

METRIC CONVERSIONS—Calculator converts metric and English units, as well as Centigrade and Fahrenheit temperature scales instantly from minus 459,40 F, to 3000 degrees C. A convenient reference for anyone involved in metric-English calculations. Durable plastic 33/8" x 81/2". Price is \$2.00. In quantities of 5 or more, \$1.60 ea. postpaid. Write for literature.



SHRINKAGE AND DRAFT-Calculator provides a time-saving and error-reducing method of determining shrinkage and draft values. Also includes charts of tap drill sizes, decimal tables, and other frequently used data. Price is \$2.00. In quantities of 5 or more, \$1.60 ea. postpaid. Used by draftsmen, tool, die, mold and pattern makers, engineers and designers. Write for literature.

KELM MFG. CO. R. #2, Coloma, Michigan

#### KELM BLUE PRINT and TOOL HOLDER

Encourages orderliness and officiency in your shop. Saves time by providing convenient, close-at-hand reference materials and tools. Satisfaction guaranteed. Available in two models from \$19.75 to \$46.50. Fits all machineshas universal mount. 18x24" of writing surface. Sturdy construction. Order from dealers or direct. Send for literature.



KELM MFG. CO. R. #2, Coloma, Michigan

## MACHINE CLEANER

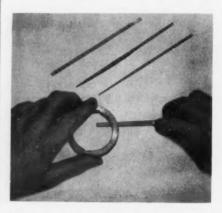
Cleans clagged T-slots \$1.95 ea. spoons out chips and brushes them away. \$19.50 Fast! Efficient!

per doz.

Convenient design, heavy duty reduces machine construction . . cleaning "down time". Thousands in use. Order from dealers or direct. Send for literature.

Clean machines produce more and last longer R. #2. Coloma, Michigan KELM MFG. CO.

new equipment . . .



View shows Titan Diamond Needle Files

selected file steel blanks by an exclusize "Chrome-Loked" process to assure maximum life and economy. The grains are uniformly distributed. Since there is said to be virtually no wear associated with the use of hard diamond, objectionable dust from bonded abrasive bars is no longer a problem. For more data circle 160 on Postpaid Card

modern machine shop

#### **ALLOY FLUX**

The Lincoln Electric Co., Cleveland 17. Ohio, has announced an agglomerated alloy flux for submerged arc fabricating or rebuilding 12-15 percent manganese steel parts. The development of Lincolnweld M-210 flux, the company states, offers maintenance cost economies in surfacing or reclaiming manganese or carbon steel parts by reducing material costs and increasing deposition rates and welding speeds. These same performance features can reduce production costs and further expand the use of composite design in original equipment manufacture, the company claims.

Physical properties of weld metal

For more data circle 578 on Postpaid Card MODERN MACHINE SHOP

297

deposits produced with Lincolnweld M-210 flux demonstrate a yield strength of 64,400 p.s.i., an ultimate strength of 107,500 p.s.i., and an elongation in 2 inches of 35 percent. Typical deposition rates of semi or full automatic single electrode submerged arc welding equipment at a 350 amp d.c. setting is 16.2 pounds of weld metal per hour at a 100 percent operating factor (arc time per cent of welding time). Where application

justifies the use of twinarc submerged arc welding equipmeent, the deposition rate can be increased to 47.0 pounds of meld metal per hour at 900 amperes d.c. and a 100 percent operating factor. In addition, the medium carbon. nickel manganese steel deposit is said to be less subject to carbide percipitation during cooling.

These weld metal properties make M-210 particularly suited to economically joining manganese to manganese or manganese to carbon steel. Typical applications would include the composite joining of premium priced manganese steel castings or forgings to a low cost carbon steel frame work or reclaiming worn carbon or manganese steel surfaces through the welded addition of suitable shaped manganese steel bars or other sections.

For more data circle 161 on Postpaid Card

\* modern machine shop

### DRY LUBRICANT

G. W. Smith & Sons, Inc., 1700 Spaulding Road, Dayton 32, Ohio, has introduced a graphite lubricant, called

Job-tested

for <u>supreme</u> accuracy

at <u>higher</u> speeds!

PRESSES



- Anti-friction bearings
- Meehanite castings
- Shear pin protection
- Precision without lock pins
- Accuracy guaranteed
- Checks alignment each index for die protection
- Low acceleration and deceleration
- · Gear or chain drive
- Hardened and ground indexing cam
- · Automatic lubrication

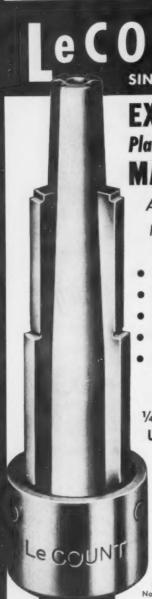
FEDERAL dial feed

PRESSES

THE FEDERAL PRESS COMPANY

Dept 904 Elkhart, Indiana For more data circle 579 on Postpaid Card

MODERN MACHINE SHOP



eCOUNT

**SINCE 1847** 

## **EXPANDING** Plain & Threaded MANDRELS

Accurate\* and positive work holding for:

- Grinding
- Turning
- Milling
- Balancing
- Inspection

THREAD SIZES 1/4"-20 to 21/2"-4 **UNC** and **UNF** 

> Left hand and special threads also available.

> > I.D. SIZES 1/4" to 7"

Widest range of expansion per mandrel; i.e. No. 1A expands from 3/8" to 3/4"; No. 2A, from 1/2" to 1", etc.

\*CONCENTRICITY GUARANTEED UP TO .0001" T.I.R.

Write today for details and prices.

LeCOUNT TOOL WORKS, INC. P. O. BOX 252 CHESHIRE, CONN. new equipment . . .



Dry Lubricant called "Dri-Slick"

"Dri-Slick," that is ready-to-use from the can. Applied with a brush to metal or wood, it dries to a hard, slick finish in about 30 minutes. The material has been formulated to overcome sliding friction problems on heavy industrial, construction or mining machinery, such as, conveyors, chains, wire rope, outdoor cranes, large open gears and sliding door channels. It is also excellent for tractor fifth wheels. railroad switches and slides of fork lift trucks. It prevents sticking of snow and ice to plow and scraper blades. The dry coating cannot be squeezed out under heavy loads, does not attract dust and dirt, will not wash off, is corrosion resistant, electrically conductive, and stands up under temperatures from minus 65 degrees F. to plus 800 degrees F., it is claimed.

For more data circle 162 on Postpaid Card

modern machine shop \*

### PIPE WRENCHES

A line of malleable pipe wrenches has been announced by Armstrong Bros. Tool Co., 5228 West Armstrong Ave., Chicago 46, Illinois, The pipe wrenches are offered in lengths of 6,

For more data on advertisement

circle 580 on Postpaid Card

## GRIND: RADIUS - ANGLES on your SURFACE GRINDER

MOST ACCURATE LOW COST DRESSERS MADE.

ONLY LOW COST DRESSERS WITH ALL WORKING & BANKING SURFACES GROUND SQUARE & TRUE FROM HOLES.

ADAPTERS FIT YOUR "RADIUS DRESSER" ON YOUR CYLINDRICAL GRINDER

guarantee

## RADIUS DRESSER \$44.

Diamond \$8.50



ANGLE DRESSER & PRECISION ANGLE PLATE



Chatter Resistant, Spring Loaded Spindle

Hardened shaft—bearing adjustable for wear.

Diamond always perfectly centered.

Easily set adjustable 180° stops.

CAPACITY—134" convex to 4" concave.

10" Wheel size for DoALL and NORTON

Grinders—\$49. Diamond \$8.50.

14", 20", 24", in stock, low price.

SPERMAN METAL SPECIALTIES

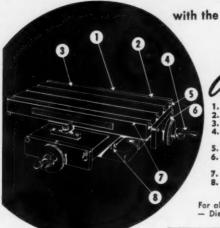
The "Mighty Midget"

Removable Angle Plate, precision ground on all six sides.

Chatter resistant, dust sealed, hardened slide. All surfaces precision ground or honed. Ball thrust bearing. Set easily and accurately. Large wheel capacity.

For more data circle 581 on Postpaid Card

## SAVE... 10-60% on Multiple Radii and Angle Milling



Lightweight Meehanite Castings All Ways and Gibs are hand scraped

2199A E. 21st ST. . BROOKLYN 29, N.

Top and Bottom are precision ground Heat treated lead screws with 21/2" bronze

nuts reduce backlash to a minimum 4 Tee Slots with 6" scales on each slide
Dials graduated from .001"-.50" per revolu-

7. TOP 8" x 12"; Length 15"; Ht. 4"; Wt. 60 lbs. 8. Locking device eliminates chance of table

For all precision work on Mold Cavities - Plungers - Dies - Templates and other intricate milling.

For further details write

LAWRENCE H. COOK, INC.

65 Massasoit Avenue • East Providence 16, R. I.

For more data circle 582 on Postpaid Card

September, 1961

MODERN MACHINE SHOP

Pat

Write today for details and prices.

LeCOUNT TOOL WORKS, INC.
P. O. BOX 252 CHESHIRE, CONN.

Ave., Chicago 46, Illinois. The pipe wrenches are offered in lengths of 6,

For more data on advertisement circle 580 on Postpaid Card

new equipment . . .



Armstrong Bros. Malleable Pipe Wrench

8,, 10, 12, 14, 18, 24, 36 and 48 inches. Opening sizes range from  $\frac{1}{6}$  inch to

6 inches. Easy adjustment, drop forged calibrated hook jaw and double action spring are features of each wrench. For more data circle 163 on Postpaid Card

\* modern machine shop \*

#### HYDRAULIC CYLINDERS

Much easier field servicing of large, heavy cylinders is the prime advantage of two changes in exterior cylinder design announced by the Miller

Fluid Power Div., Flick - Reedy Corp., 7N015 York Rd., Bensenville, Ill. In place of the square, full size retainer plate held by the tie rod nuts, Miller Model H (3,000-5,000 p.s.i.) Hydraulic Cylinders in 7 through 14 inch bores now have a small. bolted, circular retainer holding the rod seal and bushing in place. This eliminates the need of removing the tie rod nuts on these large bore cylinders. Servicing of the rod seal and bushing assembly is readily accomplished merely by removing the small circular retainer. On smaller bore Miller Model H Cylinders, which the full size bushing retainer plate is



For more data circle 583 on Postpaid Card

MODERN MACHINE SHOP

301

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ALL narrow slotting or slitting operations . . . where slotting saws cannot be used because of arbor interference . . . can now be performed faster with Quality Tool narrow width Woodruff style slotting cutters!

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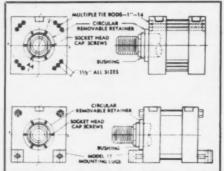
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MODERN MACHINE SHOP

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modern machine shop

### INDEXING SLIDE TABLE

Automatic multiple work positioning in any desired cycles can readily be provided on both standard and special machine tools with an indexing slide table "package" which has been announced by Russell T. Gilman, Inc., 621 Beech St., Grafton, Wis. The self-contained equipment includes: a heavy duty slide table with hardened steel ways and T-slots; a multi-station indexing mechanism with replaceable index control bar; a portable electro-



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hydraulic power pack with reservoir. and an automatic-manual remote control station that can be mounted at any convenient location.

The slide table can be used either as built-in original equipment on a special machine tool, or as a productive attachment for standard turrettype drilling machines, multi-spindle drilling machines, upright drills, boring machines and others where the tooling feeds into the work. With a controlled feed rate, the slide can also be used to advantage for certain milling and slotting operations.

A maximum stroke length of 18 inches is available. In all slide positions, the moving saddle is always supported entirely on the 52 inch hardened steel ways without overhang. The ways are lubricated with a cen-

tralized oiling system, and way wipers and way cover curtains are provided. The slide movement is powered by a 3 inch diameter. 19 inch stroke hydraulic cylinder. The 32 by 15 inch working surface of the saddle is provided with three T-slots. Overall height of the assembly is 73/8 inches. The base mounting area is 35 by 15 inches, with four slots for mounting bolts.

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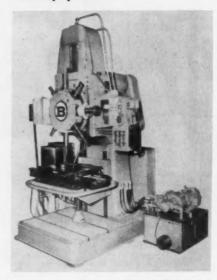
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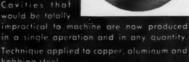
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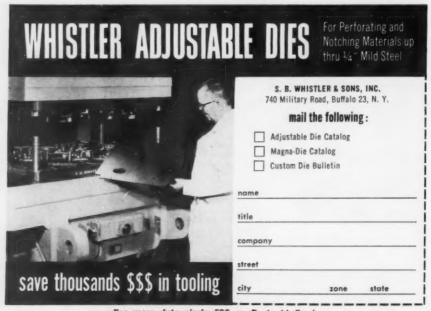
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View of Velvatap being applied to a tap

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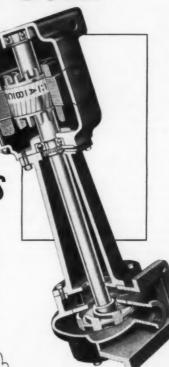
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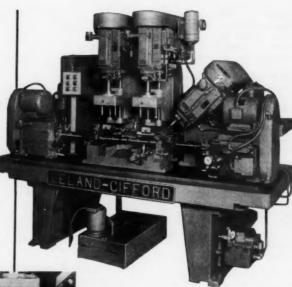
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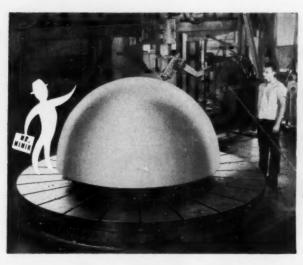
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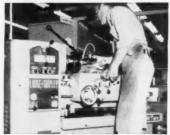




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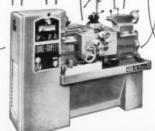
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